ADB Project Document

# TA–9036: Strategy for Liaoning North Yellow Sea Regional Cooperation and Development

## Technical Report 3: Liaoning Province's Sea–rail Multimodal Transportation Potential and its Fiscal Implications

September 2017

This report was prepared by Song YANG under the direction of Ying Qian and Philip Chang.

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**Appendix Table**

## Abbreviations

ADB – Asian Development Bank
ASEAN – Association of Southeast Asian Nations
CV – Curriculum Vitae
DOF – Department of Finance
EA – Executing Agency
GHG – greenhouse gas
IA – Implementing Agency
ICT – information and communication technology
ICTI – Internet Content, Technology, and Infrastructure
JMEPA - Japan–Mongolia Economic Partnership Agreement
LCEBDP - Liaoning Coastal Economic Belt Development Plan
LPDF – Liaoning Province Department of Finance
MDGs – Millennium Development Goals
MOC - Ministry of Commerce
MOFA - Ministry of Foreign Affairs
NDRC - National Development and Reform Commission
NEA – Northeast Asia
NSCP – North-South Corridor Plan
NSR – New Silk Road
OBOR – One Belt One Road
PFRIL - Provincial Financial Research Institute in Liaoning
PRC – People's Republic of China
RCI – Regional Cooperation and Integration
SDGS – Sustainable Development Goals
SME – small and medium-sized enterprise
SOE – State Onde Enterprise
TA – Technico Assistance Plan
TIRC - Transports Internationaux Routiers Convention
WTO – World Trade Organization

## Executive Summary

Technical Study 3 is part of a series of technical studies in TA 9036-PRC. Its objective was to research on the potentials of Liaoning's multi-modal transportation and the fiscal benefits it will bring. The study firstly provided an economic overview of Northeast China and further analyzed Liaoning's overall economic development, challenges and root causes. It then studied the development of province's transport system and summarized important achievements in Liaoning's multi-modal transportation.

Based on the above, the study went through went through an extensive review on the progress milestones, policies, mechanisms and planning in promoting multi-modal transportation in Liaoning, including studies on the potentials, SWOT analysis, progress achieved, covered geological locations and influence of sea-rail model development given numerous policy supports at national and local level, comparative studies on operation models and the active role that Liaoning is playing in promoting RCI in Northeast Asia.

By measuring the influence on multi-modal transportation in terms of national policies, technological advancement such as Internet Plus and capital introduction, the technical study has named a few cases based on each influencing factor. It then identified bottlenecks and challenges in developing multi-modal transportations in Liaoning, such as insufficient freights, higher pricing, underdeveloped infrastructure, the lack of coordinated mechanism and transfer stations etc. In the end, it proposed a few measures to further promote multi-modal transportation in Liaoning, such as develop both bulk cargo and container sea-rail multimodal transport based on the industrial structure and import and export demands of Liaoning; further integrate Internet Plus into its development course; carry out management reform and make full use of supporting policies; expand market supply and step up service quality; more investment in Infrastructure; marketization of the operation; encourage and guide private capital into the development of sea-rail multi-modal transpiration.

# I. Introduction

## A. Project Background

**1.** China's economic development stands at a key juncture as it's facing intertwined conflicts from the supply side, structural and institutional changes while calls for a deeper reform are louder than ever. Besides sharing the common challenges as faced by other provinces in China, Liaoning's economic growth is also fathomed by problems such as structural changes, economic cycles, barely surviving private businesses, fiscal distress and talent loss, etc.[1]

**2.** Liaoning's economic growth paths have gone through several stages. After the founding of PRC, the industrial base that had already enjoyed solid infrastructural construction was further boosted with large investments in the 1st five-year plan period. Under planned economy, the nation has decided to expand its industrial system and scale. In transition from a planned economy to a market economy, investments were made for technological transformation[2]. Then structural changes followed to welcome a market economy and the province's economic growth was largely driven by traditional investment. From 1990 till this year, the development of Liaoning has marked 3 stages – driven by consumer demand from 1990 till 2003, investment expansion from 2003 to 2013 and then back to a demand-driven economy after 2013. Given the stimulus plan on revitalizing the Northeast China in 2003 set out by the central government, the economy maintained steady growth from 2003 to 2007, and even outpaced the eastern provinces from 2008 to 2012. During this period, demand for investment in Liaoning boosted and led to an economic surge. After 2013, the driving force of investment demand to growth plunged while consumer demand regained its leading role in economic growth. By far, after a decade of rapid development, some systematic and institutional problems in Liaoning manifested themselves, leading to increasing downward pressure to the economy. As a result, growth rate in the Northeast China went down from 2014 to 2016, and the economy worsened into a negative growth. Obviously, the traditional investment-driven model cannot sustain the economic revitalizing in the region.

**3.** We find many reasons contributing to the economic distress, but the fundamental problems root in the institutional and mechanism challenges. Although the strategy of revitalizing the Northeast China has been put in place

[1] Wang Yong, Huo Jingwei, Jiang Xiaoqing: Alternative Industrial Choices under the New Normal of Liaoning's Economic Upgrade, Academic Journal of Northeast University, Feb of 2016.

[2] Xu Linhai: Evolution and Transformation Path of the Economic Drivers for the Old Industrial Base in Liaoning, Journals of Party Cadres, Nov of 2017

since 2003, and the region has made constant efforts in economic reform, the shadow of planned economy still lingers, the government still has its "visible hand", the market economy system is far from perfect and the local government tends to meddle into microeconomic activities. Besides, the economic structure in Liaoning is not quite balanced, with large SOEs taking a dominant part while private, medium and small-sized enterprises playing an inadequate role. The structural problems and mechanism problems together make it very difficult for economic reform. Left unaddressed and influenced by various external factors in economic transition, these problems had a sudden breakout at the same time, and caused daunting challenges for the sustainable development of the regional economy[3].

**4.** The current economic "malaise" is caused by many reasons, such as slow market reforms, an economy that's still strongly "managed" by government, underdeveloped and less scientifically planned market mechanism, heavy traditional industries in the structural mix, high cost for enterprise transformation; development mindset falling behind compared to the economically developed cities and provinces in southern China; lack of innovative business thinking; large outmigration resulting in low competiveness; inactive private economy sector, unsustainable economic growth that is driven by real estate investment, distinctive conflicts in the job market and depleting natural resources[4]. As a result, there's a growing gap between the development of Liaoning and other coastal regions, although they all have been blessed with the same geological conditions. Liaoning's economic reform and industrial transformation has never been more urgent than now at the juncture of revitalizing its economic growth as well as the regional development of NEA at large.

**5.** Among all the provinces in China, Liaoning lags behind in reforming its economic growth model. The root cause lies in slow transition from a planned economy to a market economy and inadequate transformation of governments' roles. Although reforms in the Northeast region were unveiled over three decades ago, there are still some deep-seated problems in how government ties itself with market. Government tends to manage the economy more than they should, especially in the cases of SOEs, and the truly effective market economic system is yet to be established. For example, there are many administrative procedures to go through in enterprise set-up, project investment, foreign trade, etc., which has made market entry and exit quite difficult. Government authorities usually overstep the restructuring, merger and acquisition of SOEs. However, they have

[3] Chen Fengxian: Targeted Solutions for the Institutional Challenges during the Economic Transformation of Northeast Region, Economic Review, September, 2017.

[4] Wang Shenwei, Liu Xianwei: Thoughts on the Transformation of Liaoning's Manufacturing Industry, Macroeconomic Management, September, 2017.

not fully lived up to their administration duties, leading to poor performance in public services and market supervision. Besides, unreasonable allocation of resources also undermines the operating efficiency of market economy.

**6.** Another important factor lies in the large presence of SOEs and thus a huge cost of reform. Currently, state-owned economy accounts for 45.8% in Liaoning's industrial economy, much higher than that of its coastal counterparts in the southeast like Fujian (23.6%), Guangdong (23.4%), Jiangsu (18.0%) and Zhejiang (14.9%). Many key provincial SOEs' are subsidiaries of HQs with the state as its majority shareholder. For example, state-owned shares of Shenyang Machine Tool Group account for 94% and Northern Heavy Industries Group 82.6%. In the restructuring of SOEs, due to weak profitability of most SOEs in the province, heavy burden left over by the history falls on local governments. According to the provincial government, it costs about 10.78 billion RMB for separation and transfer of water supply, power supply, heating (or natural gas in areas without heating) and property management for households of employees, about 47.36 billion for reform of collectively owned factories, 18.31 billion for social securities of the retired, 5.09 billion for clearing out shell companies. Apart from these, large amounts of money are needed to settle costs and debts after cancellation of social services provided by enterprises, transformation and relocation of industrial and mining areas, shantytowns transformation and reform of changing allocation of funds into loans[5]. To unload these heavy historical burdens of SOEs, it takes not only money, but also an effective market mechanism and vigorous government support.

**7.** What's more, brain drain is another cause of the economic plight in Liaoning. In fact, not only Liaoning, the whole Northeast area is faced with a huge loss of human resources. Its fertility rate and natural population growth rate are far below the national average, causing a diminishing population and labor force. Besides, the region suffers from labor outflow, most of which are intellectuals and technicians, capable labor force, and wealthy people. Such brain drain is devastating as human resources are the most active forces in the economic development and also represent the core competitiveness of regional development[6]. To accelerate the shift of economic development mode, an important task for Liaoning, the essence lies in technology and human resources. However, in Liaoning's case, people who study here refuse to stay due to a low level of income, people who grow up here and study elsewhere

[5] Wang Shenwei, Liu Xianwei: Thoughts on the Transformation of Liaoning's Manufacturing Industry, Macroeconomic Management, September, 2017.

[6] Cui Huiyong: Strategic Choices for the Revitalization of Old Industrial Base in Northeast, Foreign Economics and Trade, Issue No. 11 of 2017.

don't want to come back and even those who choose to stay can hardly display their talents and capabilities due to reasons like a poorly structured mechanism.

**8.** Even though faced with very complex economic situations at home and abroad, the economic development of NE region is still standing at a new starting point and embracing a number of opportunities, given that China's economic development has entered into a new stage. All things considered, the overall opportunities outweigh the challenges[7]. Acknowledging the difficulties faced by Liaoning's economic development, there are still advantages and potentials to boost growth. Liaoning enjoys a unique geological location by serving as a key gateway to connect North Yellow Sea areas. As a coastal province that also connects with many inland cities, it serves as an important natural corridor with sea ports connecting European and Asian markets. With Dalian and Yingkou becoming its' major ports, ports of Dandong, Jinzhou, Panjin and Huludao are also emerging as supporting infrastructure, which makes it suffice to realize multi-modal transport. Liaoning also enjoys comprehensive fundamentals that cover a complete set of modern technologies given its traditional development paths, therefore, it's understood that Liaoning is of key importance in promoting regional cooperation in NEA. National Initiatives such as New Silk Road and Maritime Silk Road Plan have provided new platforms for Liaoning in seeking international cooperation and economic development. To implement its obligations under OBOR by signing up to the China–Mongolia-Russia Economic Partnership Agreement, Liaoning is actively engaging in the national initiatives and regional cooperation by fully utilizing its port resources and multi-modal transport. With the opening of China (Liaoning) Free Trade Zone in early 2017, an international sea-railway multi-modal transport route will be built by largely relying on its major ports in order to be in line with the FTZ's target of becoming a high standard and high level trade zone. With all things considered, sea-railway multi-modal transport will be one of the important breakthroughs to drive the provincial and regional development given its unique geological locations and policy support, therefore, the subject of this technical study is highly relevant and deserves further study.

### B. Project Impacts and Outcomes

**9.** The study has referred to a number of literature reviews and data analysis, and paid a few field trips for further research. It starts by summarizing the current progress in developing the multi-modal transport in Liaoning and then extends its research by making comparative studies on policies and institutional problems in building and operating sea-rail multimodal transports. From the

[7] Zhang Tianwei, Jiang Ruichun, Jiangyan: Economic Development Overview of the Economy of Northeast 2016, Liaoning's Economy, Issue No.1, 2017.

perspective of promoting Liaoning's future development, the study has also produced comprehensive analysis on relevant policies, mechanisms and government planning by taking surveys. It sheds lights on the progress, strategies, specific requirements, geological locations covered and scope of impacts under the context of a series of national initiatives, such as OBOR, revitalization of the North East China, development of the FTZ of Liaoning, and cooperation with internet technologies. By including a few case studies on the relevant subjects, comparative studies were made on the growth paths of multi-modal transport between coastal provinces at home and abroad, measured with metrics such as implementation and institutional environment. A series of feasible proposals have been made by effectively identifying the bottlenecks and potentials and taking into account of the general layout and available data and indicators.

### C. Research Overview

**10.** The study firstly provides an overview on Liaoning's economic and transport development along with its supporting systems while highlighting the development of multi-modal transportation and the progress it has achieved.

**11.** On this basis, further research and comprehensive analysis are carried out to study relevant policies, institutions and national initiatives on developing sea-rail multi-modal transport in consideration of Liaoning's future development. It sheds lights on the progress, strategies, specific requirements and scope of impacts given the context of a series of national initiatives, such as OBOR, revitalization of the North East China, development of the FTZ of Liaoning, etc. Besides, it touches on the active roles Liaoning's playing in promoting regional RCI in NEA. After going through relevant fiscal and supporting policies, a series of problems and bottlenecks are identified by taking into account of the prevailing economic situation. After identifying a few constraints such as high costs, lack of coordinated operational mechanisms and information networks, etc., the study recommends a few proposals to promote multi-modal transport.

### D. Index Table of Policies Listed in I

| NO. | Policy | Time of Release | Publisher |
|---|---|---|---|
| 1 | *Several Opinions of the State Council on Comprehensive Revitalization of the Northeast Industrial Base* | 2016 | State Council |
| 2 | *13th Five-Year Plan for Revitalization of Northeastern China* | 2016 | State Council |
| 3 | *Opinions on Several Major Policy* | 2014 | State Council |

| | | | |
|---|---|---|---|
| | *Initiatives Supporting the Revitalization of Northeast China* | | |
| 4 | *Framework Plan for China (Liaoning) Pilot Free Trade Zone* | 2017 | State Council |
| 5 | *Report of the Work of People's Government of Liaoning Province in 2015* | 2016 | People's Government of Liaoning Province |
| 6 | *Report of the Work of People's Government of Liaoning Province in 2014* | 2015 | People's Government of Liaoning Province |
| 7 | *Opinions on Further Deepening Reform of Stated-owned Assets and Stated-Owned Enterprises under Provincial Administration* | 2014 | People's Government of Liaoning Province |
| 8 | *Implementation Plan of Liaoning Province on Reform-driven Development Strategy* | 2015 | People's Government of Liaoning Province |
| 9 | *Outline of Liaoning Province on the Development of National Economy and Society in the 13th Five-year Period* | 2016 | People's Government of Liaoning Province |
| 10 | *Guiding Opinions on Optimizing Industrial Layout and Structural Adjustment* | 2015 | People's Government of Liaoning Province |
| 11 | *Opinions on Major Work in Deepening Reform of Economic System in 2016* | 2016 | National Development and Reform Commission |

## II. Potential Analysis of Liaoning's Sea–Rail Multimodal Transportation

### A. Macroeconomic Overview

**12.** China has entered a period of "new normal" where its economic growth rates have gradually moderated (annual GDP growth of 7%) from the previous high speed (annual GDP growth higher than 10%), now driven by innovations in production factors, investments and structural reforms[8]. It's a safe assumption that the "new normal" of China's economy has become a major feature of China's economic development, thus, a macroeconomic context to review Liaoning's economic development. The revitalization of Liaoning is not only of high relevance to the regional development of NEA but also a vital part of China's economic growth.

**13.** Given the global economic meltdown and China's economic slowdown, Liaoning's development is facing an even steeper downward spiral, featuring drastic drop of economic growth rate, and insufficient supply. Deeply-rooted constraints that have long hindered the province's development, institutional defects, under-served market, undesired environment for innovations and startups, no concrete reforms for SOEs, a fixed mindset, poor private sector, persisting economic structural conflicts, traditional industries becoming less competitiveness, under-developed emerging and modern service industries that are strategically important, stressed national resources supply, lack of R&Ds and talents, insufficient scientific transformations, lack of good governance and capacity building, etc., to just name a few[9].

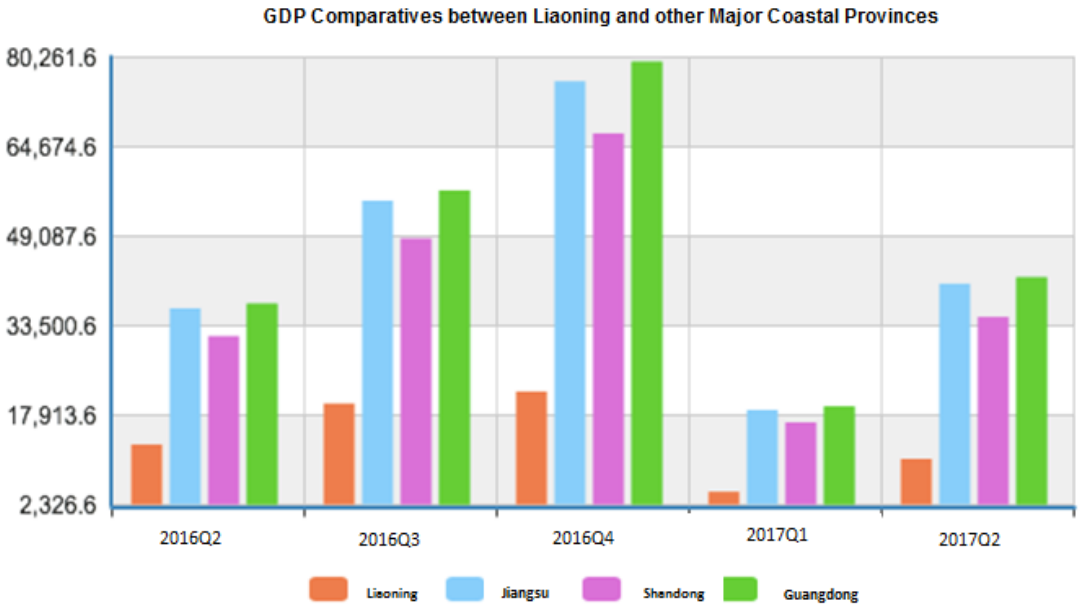
**14.** Data from national and provincial bureau of statistics clearly indicates an economic downturn in Liaoning, turning to a negative growth by 2016. GDP growth stood at 2.6%, 6.1% and 5.1% for Liaoning, Jilin and Heilongjiang

[8] Wang Yong, Huo Jingwei, Jiang Xiaoqing: Alternative Industrial Choices under the New Normal of Liaoning's Economic Upgrade, Academic Journal of Northeast University, Feb of 2016.

[9] Circular on the 13th Five Year Plan of Liaoning's Economic and Social Development, Liaoning People's Government, March, 14th of 2016.

respectively, all lower than the national average level with Liaoning ranking as the tail ender. The figure turned to a negative 1% for Liaoning in the first half year of 2016 and further slide into -2.5% by year end. The province's economic growth rate still ranked at the very bottom till Q2 of 2016, and finally turned around to a positive 2017Q1.

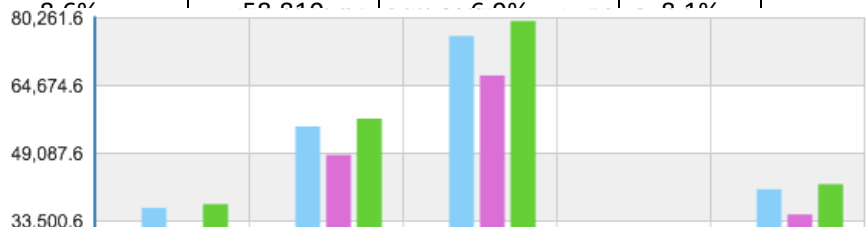
**Figure 1 GDP Comparatives between Liaoning and other Major Coastal Provinces**




Source: National Bureau of Statistics
Unit: 100 Million RMB

**Table 1 GDP Growth Rates 2016 to 2017Q1 for 31 Provinces and Cities**

| GDP Growth Rates 2016 to 2017Q1 for 31 Provinces and Cities | | | | | |
|---|---|---|---|---|---|
| **Provinces and Cities** | **Rank** | **2017Q1 GDP growth rate** | **2017Q1 GDP (100 million RMB)** | **2016Q1 GDP growth rate** | **Annual GDP growth of 2016** |
| **Tibet** | 1 | 11.0% | 27.135 | 10.7% | 10.0% |
| **Chongqing** | 2 | 10.5% | 430.674 | 10.7% | 10.7% |
| **Guizhou** | 3 | 10.2% | 250.483 | 10.3% | 10.5% |
| **Yunnan** | 4 | 9.9% | 311.566 | 6.6% | 8.7% |
| **Jiangxi** | 5 | 9.0% | 431.860 | 9.1% | 9.0% |
| **Hainan** | 6 | 8.9% | 105.639 | 9.7% | 7.5% |
| **Fujian** | 7 | 8.6% | 653.519 | 8.3% | 8.4% |
| **Ningxia** | 8 | | | | |
| **Anhui** | 9 | | | | |



| | | | | | |
|---|---|---|---|---|---|
| **Sichuan** | 10 | 8.2% | 755.200 | 7.4% | 7.7% |
| **Shaanxi** | 11 | 8.1% | 414.722 | 7.6% | 7.6% |
| **Tianjin** | 12 | 8.0% | 466.718 | 9.15 | 9.0% |
| **Henan** | 13 | 8.0% | 939.222 | 8.2% | 8.1% |
| **Zhejiang** | 14 | 8.0% | 1055.200 | 7.2% | 7.5% |
| **Guangdong** | 15 | 7.8% | 1943.805 | 7.3% | 7.5% |
| **Shandong** | 16 | 7.7% | 1665.330 | 7.3% | 7.6% |
| **Qinghai** | 17 | 7.6% | 52.401 | 8.3% | 8.0% |
| **Hubei** | 18 | 7.6% | 725.406 | 8.1% | 8.1% |
| **Xinjiang** | 19 | 7.6% | 179.185 | 6.9% | 7.6% |
| **Hunan** | 20 | 7.4% | 705.110 | 7.3% | 7.9% |
| **Inner Mongolia** | 21 | 7.2% | 374.220 | 7.2% | 7.2% |
| **Jiangsu** | 22 | 7.1% | 1882.260 | 8.3% | 7.8% |
| **Beijing** | 23 | 6.9% | 604.050 | 6.9% | 6.7% |
| **Shanghai** | 24 | 6.8% | 692.284 | 6.7% | 6.8% |
| **Hebei** | 25 | 6.5% | 751.240 | 6.5% | 6.8% |
| **Guangxi** | 26 | 6.3% | 390.953 | 7.0% | 7.3% |
| **Gansu** | 27 | 6.1% | 138.875 | 7.3% | 7.6% |
| **Heilongjiang** | 28 | 6.1% | 279.800 | 5.1% | 6.1% |
| **Shanxi** | 29 | 6.1% | 280.940 | 3.0% | 4.5% |
| **Jilin** | 30 | 5.9% | 268.343 | 6.2% | 6.9% |
| **Liaoning** | 31 | 2.4% | 457.470 | -1.3% | -2.5% |

Source: reports from NPC & CPPCC issued by local governments and local Bureau of Statistics

**15.** Although challenged by many difficulties and drastic difference in economic scale from the other coastal provinces, there are still potentials given the province's economic foundations and conditions. Growth is observed in the province's emerging and service industry benefiting from a sound industrial and equipment foundation. Therefore, Liaoning shall transform from the traditional development mindset based on its structural reforms in order to display its full potentials and materialize economic recovery. Standing at the key juncture of transformation, an improved transport system is crucial to the growth of emerging industries and reforms of traditional industries. It's expected that a well-coordinated and seamlessly connected multi-modal transport system will provide high efficiency and overall advantage in integration. Therefore, to develop Liaoning's transport system and establish a multi-modal transport becomes a necessary choice for boosting it economic growth.

## B. Growth Patterns and Potentials of Liaoning's Transport System

### *1. Policies and mechanisms*

**16.** There are quite a number of supporting policies from national and provincial levels, ranging from the strategy of "Revitalization of NEA" and "Plan on Adjustment and Revitalization of Logistics Industry" and the establishment of Liaoning FTZ, all of which have included the construction and development of transport systems in Liaoning and provided policy guarantee for both the economic and transport development of Liaoning and revitalization of NEA. The

NEA Revitalization strategy entails preferential policies to promote transport development in Liaoning, and tax and fiscal policy support to NEA regions. In order to improve sea-rail multi-modal transport and logistical throughput of transport hubs for international commodities, policy emphasis was given to step up infrastructural constructions of multi-modal logistics to serve as transport hubs connecting major ports, international transfer stations that accommodates both containerized maritime shipment and freight, multi-functional international freight stations, international airports, etc.[10]

**17.** The *Medium and Long-term Railway Network Plan* released by NDRC, Ministry of Transport and China Railway in July, 2016 has clearly outlined priorities to develop a well-connected and modern railway lines and extensions that provide effective supports to the logistics of resource-intensive regions, key ports and logistics parks so as to promote multi-modal transport and a seamless railway connection for the "first and last-mile". The plan is set to build an international corridor that links inlands with sea-railway multi-modal transport supported by comprehensive railway networks and distribution system connecting coastal cities and key ports in Dalian, Qinhuangdao, Tianjin, Lianyungang, Shanghai, Ningbo, Zhoushan and Shenzhen, etc. Meanwhile, to realize multi-modal transport requires a seamless connection and one-stop service featuring highly efficient transport hubs for freights, container shipments, distributions and international multi-modal transport. In December of the same year, the Ministry of Transport along with 17 other relevant authorities have co-issued the *Circular of Further Encouraging Multi-Modal Transport*, which highlights an orderly transformation of medium and long distance freights from highways to transport modals such as railways and maritime shipments; further reforms to privatize railway freights, innovations on the management and organizational models of railway freights[11]; establishing and improving a pricing mechanism that fully reflects market demand and supply, competitiveness and quality services.

**18.** The circular gave clear directions for the development of Liaoning's multi-modal transport. In its *Development Plans for National Economy and Social Development* in 2015 and 2016, Liaoning strategized to live its obligations under "OBOR" by fully utilizing the China-Europe container trains and speeding up the construction of Maritime and Overland Logistical Channel. Meanwhile, it will push forward projects along the railway lines of China-Europe container networks to facilitate sea-rail multimodal transport. Enterprises are encouraged to set up product sales centers and industrial parks with international businesses

[10] Xin Xiafen, Thoughts on further Developing China's International Logistics, Logistic Engineering and Management, Issue No. 12 of 2010.

[11] 18 Sea-Rail Multimodal Transportation Encouraged by Competent Departments to Promote Market Reform, Ports Economy, Issue No.1 of 2017

partners to facilitate trade with Russia and Mongolia. Liaoning will actively participate in building Sino-Korea FTZ so as to expand business opportunities with Russia, ASEAN, Africa, South America and Pacific Islands.

**19.** In terms of regional cooperation, Liaoning strengthens economic ties with nations along the China-Mongolia- Russia Economic Corridor. It will actively engage in cross-border logistics to stimulate transit trades by relying on key harbor cities such as Dalian, Yingkou, Jinzhou, Dandong and Panjin. Moreover, Liaoning is committed to promoting cooperation in transport, energy, industries and public services with Bohai Economic Rims in order to play a more active role in RCI. Therefore, to develop sea-rail multi-modal transportation is in compliance with national policies but also the development priority of the province itself as well as Bohai Economic Rims.

### *2. Infrastructures and natural conditions*

**20.** There are quite a few ports and airports in Liaoning providing plentiful port resources to the province; however, what Liaoning urgently needs is to integrate all these resources. It's challenging to build up a NEA Shipping Center without being equipped with a certain level of scale to accommodate large volumes of freights and shipments. Therefore, Liaoning shall integrate all kinds of resources such as ports, airports and railways so the whole competiveness of Liaoning's transport can be stepped up and the full potentials of Liaoning's multi-modal transport can be unleashed.

**Table 2 Overview on Liaoning's Transportation 2009 to 2015**

| Overview on Liaoning's Transportation 2009 to 2015 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Indicator | | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| Length of Transportation Routes (km) | Railway mileage | 3962 | 3988 | 4035 | 4757 | 4875 | 4899 | 5328 |
| | Highway mileage | 101117 | 101545 | 104026 | 104679 | 110072 | 114504 | 119362 |
| | Inner river mileage | 813 | 813 | 813 | 813 | 813 | 813 | 813 |
| Freight Volumes (10KT) | Railway | 139541 | 163303 | 190329 | 212957 | 215375 | 231742 | 208562 |
| | Highway | 18262 | 18622 | 18716 | 17388 | 20484 | 19103 | 14541 |
| | Waterway | 105088 | 127361 | 151773 | 174355 | 172923 | 189174 | 172140 |
| Throughput of major costal ports (10KT) | | 55513 | 67952 | 78374 | 88502 | 98354 | 103675 | 104859 |
| Source: Liaoning Statistical Yearbook 2016 | | | | | | | | |

**21.** Transport infrastructure was growing steadily given the growing routes' lengths for both railways and highways from 2009 to 2015, but the carrying volumes for railways, highways and waterways are declining from 2014 to 2015 affected by Liaoning's economic downturn (see Table 3). Meanwhile, investment in

infrastructure dropped in 2015. However, indicators from January to May 2017 show that the decline in investment is narrowing down while transport and telecommunications sector are continuing a positive growth after a transitioning 2016. Total investment from January to May registered at 44.38 billion RMB, down by 30% year on year but the decline narrowed by 2.7% January to April, among which, investment in postal logistics accounted for 260 million RMB, up by 970%; pipeline 2.7 billion RMB, up by 270%; power and thermal energy production and supply industry 13.89 billion RMB, up by 28.9%, handling services and shipping agents 860 million RMB, up by 1%. It can be concluded that infrastructure construction and investment in Liaoning is steadily moving forward with decline continuing to narrow down for a consecutive 3 months till Aug. 2017.

**22.** Liaoning has equipped itself with a sound foundation for providing interconnected infrastructure. So far, interprovincial pathways connecting Liaoning with neighboring provinces (regions) have been fully accessible and there are 92 shipping routes supporting container shipment to facilitate trade with over 100 nations and regions. The multi-modal transport project connecting Yingkou, bypassing Manzhouli and reaching Russia and Europe through Eurasia Land Bridge, has been running 5-6 times of railway/shipment per week since its launching in 2008, ranking number 1 in the nation. Exponential growth has been observed in the shipment capacity of sea-rail multi-modal transport since 2012 with an annual growth rate over 50%, taking up 93% of the total container shipment in North East Ports, 50% of the national total, and topping the nation[12]. Launched in June, 2013, shipment through Dalian-Europe Cross Border Corridor increased by 300%. By the above means, Liaoning is actively building a seaport cluster in Bohai Economic Rims in order to serve as an international hub for logistics and trade in NEA regions.

### *3. Potentials of sea-rail multimodal in transportation system*

**23.** Transport serves as fundamentals to support regional economic growth while developing cross-border multi-modal transport will be a pivotal driver to Liaoning's economic growth. Compared with developed countries, multi-modal transport is still at a developing stage, challenged by a singular development modal, insufficient traffic networks, and low level of professional organizational management, ill-integrated operations and lack of supporting policies, legislation, technical specifications and technologies. Given that and along with the OBOR

[12] Liaoning Aims Higher for Overseas Market, International Business Daily, Jan. 15th, 2015.

initiative and China's middle and long term logistical policies, multi-modal transport will surely embrace quite a number of important opportunities[13].

**24.** The types of multi-modal transport varied from land-bridge, sea-rail, air-bridge, connected by international multi-modal transport routes, such as shipment routes from inland China to Japan, United States, Africa, West Europe and Australia, and Siberia land-bridge routes bypassing Mongolia to Russia, Iran and finally reaching North Europe. Among these types of multi-modal transportation, management and operation of containerized railway transport have been undergoing drastic reforms with railway becoming a major approach of international transportation.

**25.** As the most commonly applied means among multi-modal transports, sea-rail transport is obviously a more optimized combination of transportation models as both enjoys larger carrying capacity and lower rates compared with a land-air transport model. Besides, a sea-rail combination can fully play the advantage of the preferential shipment rates and higher efficiency of land transport. The sea-rail model's carrying capacity usually takes up 20-40% of TEU throughput in the cases of many developed countries and its share is lower in China because China is a late-comer in this regard. By 2014, TEU throughput by sea-rail transport has taken up 2% of the total 182 million TEU in China, reaching 4million TEU. Although enjoying a promising future, the slow development of sea-rail modal has not yet fully lived up to its potentials. There have been four key sea-rail routes in China, namely, Dalian-Yingkou port; Tianjin port; Lianyungang-Qingdao; Shanghai port.

**26.** Although encountering a slow economic recovery in recent years, there are noticeable increases in railway freight and maritime shipment, for example, TEU throughput carried by sea-rail transports in 2016 was up by 23%。

### *4. SWOT analysis*

**27.** Both sea and rail transport feature large carrying capacity and low freight rates. As an optimized combination of the two ways of transportation, sea-rail multi-modal transportation integrates low cost of sea transport and high efficiency of overland transport. But compared with other countries, China is still at the infant stage. Based on its current development in China, we conduct a SWOT analysis to look into its strengths (S), weaknesses (W), opportunities (O) and threats (T). In the analysis, strengths (S) and weaknesses (W) are categorized as internal factors while opportunities (O) and threats (T) external factors.

[13] Dai Yujie, Bao Lukun, Sun Yanhao: SWOT Analysis of International Multimodal Transport under OBOR, Railway Transport and Economy, Issue No. 4 of 2017.

*a) Strengths*

**28.** In recent years, China's rail network structure and carrying capacity have been constantly improved, which makes it possible to develop container rail-sea intermodal transportation. During the 12th five-year plan period, a total of 3.58 trillion RMB was invested in fixed assets of rail transport, extending rail lines by 30, 500 km. On the basis of the "Four Vertical and Four Horizontal" network and the major layout of rail lines in China, the Development Plan of Railway during the 13th Five-year Plan Period proposes to carry out a series of high-speed rail projects that are ready. During the 12th five-year plan period, a total of 3.58 trillion RMB was invested in fixed assets of rail transport, extending rail lines by 30, 500 km. On the basis of the "Four Vertical and Four Horizontal" network and the major layout of rail lines in China, the Development Plan of Railway during the 13th Five-year Plan Period proposes to carry out a series of high-speed rail projects that are ready. Meanwhile, governments will continue to increase investments to build new rail lines and renovate old ones. For example, in Liaoning province, according to its 13th five-year plan, it would continue the construction of 15 rail projects, covering a total distance of 1386 km (with 715 km newly built and 671km renovated), with a total investment of 101.5 billion RMB (74.3 for newly built lines and 27.2 for renovated lines). By the end of 2015, 28.3 billion of investment had been made and 14 new projects are expected to commence, covering a total distance of 1589 km (437km newly built and 1152km renovated) with a total investment of 62.7 billion RMB (36.5 for newly built lines and 26.2 for renovated lines).

**29.** Meanwhile, growing importance attached by governments and enterprises. From the perspective of equity and efficiency, governments and enterprises attach more and more importance to rail-sea intermodal transportation and have adopted a series of measures to improve its share in freight carriage. On the basis of existing freight sources, efforts are being made to expand and develop new and non-hinterland sources of freight for leapfrog development of multi-modal transportation.

*b) Weaknesses*

**30.** There's inadequate carrying capability and underdeveloped service sector. Though transport capacity has gradually improved in China, in terms of distribution, flow direction and flow volume of freight, railway container transport is mainly undertaken by the Railway Bureaus in Beijing, Shanghai, Guangzhou, Zhengzhou and Shenyang. The total container volume in these 5 major Railway Bureaus account for more than 70% of the national total, leading to almost full utilization of major rail lines like Beijing-Guangzhou, Beijing-Shanghai, Beijing-

Kowloon, Zhejiang-Jiangxi, Beijing-Harbin and Longhai railway. Besides, there is competition over operation lines between container lines and passenger lines and parcel lines, greatly restricting the growth of container intermodal transportation[14].

**31.** Meanwhile, most harbor districts are not seamlessly connected with railway. There's still a need for drayage to transfer freights between ports and railways. The high operation costs contributed to undesired pricing by railway transportation. Such poor connection between rail transport and sea transport increases costs and impairs display of advantages of rail-sea intermodal transportation in high efficiency and security.

**32.** The lack of professionals also creates obstacles for its development. In practice, operation of rail-sea intermodal transportation relies on the application and development of information technology, thus requiring the establishment of an information-based transaction and operation platform. But now China is short of talents in this field, which is another challenge we need to tackle in the future.

*c) Opportunities*

**33.** The huge demand for international multi-modal transport, green transportations and the established infrastructure fundamentals serve as a sound foundation and will bring new opportunities for the development of China's sea-rail multimodal transportation. Besides, there's large room for improvement of sea-rail multi-modal transportation and long term development for integrated logistics services. At present, China's rail-container volume is just about 10 million TEU every year, only 2% of the total, a very small part in the whole picture. Therefore, it is fair to say rail-sea multi-modal transportation enjoys a large space to expand.

**34.** Logistic industry in China is standing at a new development stage that's now focusing on industrial upgrade and transformation which brings an opportunity window for port logistics to develop towards an integrated logistic service. The current trend shows ports need to chart out a rail logistics network, apart from roads and waterway transportation, no matter for providing integrated logistics services or advancing stable integrated transport systems, in order to play a dominant role in the integration, improvement and optimization of the whole

[14] Mu Zhiliang, Li Zhenfu: SWOT Analysis of Containerized Multimodal Transport under OBOR, Railway Transport and Economy, Issue No. 10 of 2017

logistics chain. Such transition from port logistics to integrated logistics brings great opportunities for intermodal transportation[15].

*d) Threats*

**35.** Despite the sound opportunities and attention given by government and enterprises, we also need to be aware of the potential threat to its development. The service market is yet to be established. In current stage, market of ship agencies and freight forwarding in China has gradually come into shape. But relatively mature maritime transport service providers can often only be found in coastal cities while service market in inland cities is yet to be nurtured. What's more, lack of a good market climate and a sound competition mechanism also makes it difficult to deliver "door-to-door" service in rail-sea multi-modal transportation. It would require a coordinated development between coastal and inland multi-modal transportation so to form up an improved market operation and competition mechanism. However, many of the coastal cities that are developing sea-rail models are still relying on supporting government policies and poorly supported by the transportation service market in inland cities, so a marketized operation is hard to be guaranteed.

**36.** Meanwhile, there's a lack of coordination among many of the coastal cities, which leads to overlapping businesses and fierce competition, or even vicious competition. Besides, although there's a universal application of freight management system and EDI, the information supporting system, namely, TMIS system is still underdeveloped, resulting in a lack of information sharing among shipping companies, ports and inspection bureaus and inefficient management of container cargos and timely tracking, causing low efficiency in multi-modal transportation.

**Table 3 SWOT Analysis on China's Sea-Rail Modals**

| | | |
|---|---|---|
| **Internal Factors** | **Strengths** | **Weaknesses** |
| | ① Continuous improvement on the carrying capacity of railway and the network structure<br>② Growing importance attached by governments and enterprises<br>③ Broad prospects of sea-rail multi-modal transport | ① Inadequate carrying capability and structure of rail network<br>② Transport risks and differences due to different containers<br>③ Inadequate services<br>④Insufficient infrastructure<br>⑤ Lack of professional talents |
| **External Factors** | **Opportunities** | **Threats** |
| | ① A large room for development<br>② Opportunities brought by transition from port logistics to | ① Strong competition as opposed to railway<br>②Incompatible services from third |

[15] Dai Yujie, Bao Lukun, Sun Yanhao: SWOT Analysis of International Multimodal Transport under OBOR, Railway Transport and Economy, Issue No. 4 of 2017.

| | | |
|---|---|---|
| | integrated logistics<br>③ Vigorous policy support<br>④ Opportunities brought by OBOR Initiatives | party logistics<br>③ Underdeveloped information system |

**37.** It's important that we shall develop containerized railway transport, strengthen infrastructure and create a sound clearance platform by fully displaying the advantages of the growing railway capacity and improving road networks in compliance of the OBOR Initiatives based on the SWOT analysis of Table 3. The development of sea-rail multi-model transport shall also seize the window of opportunities brought by strong policy support. Meanwhile, we also need to overcome some internal weaknesses to minimize its setbacks towards opportunities so to seek further development. It is expected road transport enjoys a clear edge in short distance logistics, so the sea-rail model shall avoid a direct competition in this regard and focus on providing medium and long distance transport service. We shall also draw upon the good lessons and avoid external risks by studying on international cases.

### *5. Potential analysis of international expansion*

**38.** Liaoning not only enjoys its own advantage and potentials in sea-rail multi-modal transportation, but also a clear cutting edge in geographical locations, market demand and policy supports in NEA, which play important roles in NEA integration.

#### *a) A Clear Geographical Edge*

**39.** As one of them most developed region in Asia, NEA enjoys rich natural resources and population density, while the northeast China is located in the central belt of NEA, and therefore, enjoys a clear edge in geographical locations to conduct economic trades. It's connected with land routes of Russia, Mongolia and North Korea and just an ocean apart from Japan and Korea, The costal ports of Liaoning, such as Dalian, Yingkou and Dandong serve as an important passage to connect sea-rail transportations between Eurasia and Japan and Korea. Compared to the connectivity of Northwest china with Eurasia, Northeast China provides cheaper transportation with better time efficiency, less transferring nations and thus, lower customs. Further development in sea-rail multimodal transport in Liaoning will effectively promote regional trades, lower transport cost, enhance regional competitiveness and provide a unique geographical advantage in strengthening economic ties within NEA. An improved traffic network will better secure the economic trades and cooperation for NEA.

**40.** As an important connection between Northeast China and NEA, the development of international sea-rail modal in NEA will surely promote the economic reform of Liaoning itself and drive the regional cooperation in NEA. It will also effectively promote economic integration of NEA and a scaled development of sea-rail multimodal.

*b) Strong National and Regional Policy Support*

**41.** *The Vision and Action Plan in promoting the Economic Belt of Silk Road and 21st Maritime Silk Road issued* in 2015 has strategized the 3 Northeast provinces as important gateways to open up to nations in the north of China. As one of the practitioners of OBOR, Northeast of China has opened up railway routes connecting with west of Siberia, which will spur economic cooperation among Northeast of China, Russia and Europe and economic integration of inlands of Eurasia by developing sea-rail multimodal cooperation of Hei Longjiang, Ji Lin and Liaoning with far east of Russia. Regional economic cooperation will be better facilitated with OBOR initiatives so regional economies' development will be well coordinated[16].

**42.** To plan the development of Northeast China in compliance with national initiatives will not only revitalize the economy of Northeast but also drive the regional economic cooperation, and discover new development paths for Northeast China including Liaoning. Now Northeast regions have come up with development plans to promote connectivity and actively engage in the development of sub-regional development of the "Russia-Mongolia-China Road Corridor", "Economic Circles of China, South Korea and North Korea", "China-Japan-South Korea FTZ" etc. to echo with the OBOR initiative. While driving economic development in Northeast China, these development plans will also move forward regional cooperation and provide novelty thinking for developing regional cooperation such as "China-Japan-South Korea FTZ" and "Tumen Development Program". The connectivity enhanced by sea-rail modal, port construction, cross-border trains will start from the development of infrastructure constructions of sea-rail modal and facilitate traffics for some of the routes and ports connecting Northeast China with NEAs, and bring new vitality for regional cooperation.

*c) Strengthening Regional Cooperation and Planning*

**43.** Considering the vast differences of economic development, structures, natural resources of NEA nations, there's a clear advantage for regional cooperation. For example, given the abundant natural resource yet lack of labor force in

[16] Hu Renxia, Li Xiaole: Economic Transformation of Northeast China and OBOR, Journal of Yanbian University, Social Sciences, March, 2016.

Russia and Mongolia and cutting edge technologies yet insufficient labor and natural resources in Japan and North Korea[17], NEA nations can coordinate and provide complementary advantages in regional recourses and technological structures in order to realize common development of NEA. In consideration of sufficient natural and human resources of Northeast China, vast consumer market supported by strong industrial foundations, it can pursue cross-border investment of cooperation in industries of power, metallurgy and manufacturing, where it clear enjoys an advantage. Meanwhile, although affected by global financial crises and an economic slowdown, the economic and trade between NEAs is still moving forward on a steady pace.

**44.** Historically, NEA nations have maintained sound economic ties and friendship with China. By availing the opportunity of increasing connectivity presented by OBOR, it's important that we fully display the advantages of historic resources and geopolitical economics and utilize the connectivity of sea-rail passage, the establishment of an international logistic center to provide logistic movement of complementary production factors and facilitate the integration of regional resources and co-development of the whole region.

### C. Index Table of Policies Listed in II

| NO. | Policy | Time of Release | Publisher |
|---|---|---|---|
| 1 | *Development Plan of Liaoning Province on Coastal Economic Belt* | 2009 | State Council |
| 2 | *Plan on Adjustment and Revitalization of Logistics Industry* | 2009 | State Council |
| 3 | *Development Plan of a Modern and Integrated Transportation System in the 13th Five-year Plan Period* | 2017 | State Council |
| 4 | *Outline on Cooperation and Development of Bohai Economic Rims* | 2015 | National Development and Reform Commission |
| 5 | *Program of Liaoning Province in Participating the " Belt and Road " Initiative in the 13th Five-year Plan Period* | 2016 | People's Government of Liaoning Province |
| 6 | *Implementation Plan of Liaoning Province in Participating the " Belt and Road " Initiative* | 2016 | People's Government of Liaoning Province |
| 7 | *Development Plan of Liaoning Province on Integrated Transport Development* | 2017 | People's Government of Liaoning Province |
| 8 | *Medium and Long-term Railway* | 2004 | National Development |

[17] Qiu Fahua, OBOR and Regional Cooperation in NEA, China's Foreign Affairs Journal, Issue No.2, 2015

| | | | |
|---|---|---|---|
| | *Network Plan* | | and Reform Commission; Ministry of Transport; China Railway |
| 9 | *Joint Notice of 18 Departments on Further Encouraging the Development of Multimodal Transport* | 2017 | Ministry of Transport ;Ministry of Foreign Affairs; National Development and Reform Commission, etc. |
| 10 | *Report on Implementation of Economic and Social Development Plan of Liaoning Province in 2015 and Draft of its Plan in 2016* | 2016 | Liaoning Provincial Development and Reform Commission |
| 11 | *Report on Implementation of Economic and Social Development Plan of Liaoning Province in 2016 and Draft of its Plan in 2017* | 2017 | Liaoning Provincial Development and Reform Commission |

## III. Current Development of Liaoning's Sea-Rail Multimodal Transportation

**45.**The study summarized on the built or initially completed sea-rail multimodal transport development through a series of analysis of the data and documentations acquired from the Ministry of Transport, statistical bureaus, governments of Liaoning, Dalian, Yingkou, Shenyang and Panjin.

### A. Development of Three Key Channels

**46.** The development of three key comprehensive transport channels, namely, "Liaoning-Manzhouli-Europe", "Liaoning-Mongolia-Europe" and "Liaoning-Bering Straits-Europe", has achieved breakthroughs under strong support of transport department of Liaoning and built a sea-rail transport network connecting all territories in North East China with Europe.

#### *1. "Liaoning-Manzhouli-Europe" Channel*

**47.** "Liaoning-Manzhouli-Europe" Channel is a sea-rail transport route starting from Dalian, Yingkou, Shenyang, Panjin, reaching the land-bridge in Europe bypassing Russia. Direct railway lines linking cities like Moscow, Warsaw, Minsk, Kaluga and Novosibirsk have been now accessible for container freights.

**48.** 472 times of train transport for the "Liaoning-Manzhouli-Europe" Channel have accumulatively shouldered 39,000 TEU shipments from Dalian port and Yingkou port, up by 74.9% year on year in the first of 2017. Dalian port has now been linked with 7 cross-border railway lines along the "Liaoning-Manzhouli-Europe " Channel after ties being established with railway companies in countries such as Russia and Germany. Among the three channels, the "Liaoning-Manzhouli-Europe" is the only route that connects trains to depart from ports, which truly realizes a seamless connection between sea and railway transport. There are 221 trains departing from Dalian port in 2016, which boosted cross-border TEU shipment by 150% and cut the total transportation cost by 46% and time of delivery by 40%[18]. China-Europe freight trains set out from Dalian port have extended to a specialized category of trains like China-Belarus Industrial Park Trains and Samsung Trains, and fully refrigerated container trains, among which, 15% of the freights coming from Japan and South Korea, 3% from South East Asia, 80% from Guangdong, Shanghai, Tianjin and Beijing. Dalian enjoys a geological advantage in

[18] Zhao Guanghui: Dalian Port's transit container volume has increased by 150% annually, Liaoning Daily,May 26, 2017.

promoting sea-rail, air-road and sea-air multimodal transport in order to link with Japan, Korea, South East Asia and Europe. As the nearest port to Northeast China and East Inner Mongolia, Yingkou Port has equipped 11 China-Europe freight lines bypassing Manzhouli port. Setting out 7-8 times every week, this route covers a rail length of 6,500 km and can complete shipment within only 10 days, which has set up a new record for the China-Europe freight lines departing from Yingkou port. Meanwhile, Dalian Customs has been coming up with individualized services and supervision, like setting up timetable for China-Europe freight lines, 24-7 appointment services for clearance, one-stop clearance, hotlines for Q&As, They've also enhanced communication with local governments and relevant port authorities to streamline procedures and improve efficiency for clearance.

### *2. "Liaoning-Mongolia-Europe" Channel*

**49.** The "Liaoning-Mongolia-Europe" Channel is a railway route connecting Jinzhou port, Panjin port with Choybalsan in Mongolia as its destination, passing through the port of Jengadab. Railways constructions within China have been completed and the 300 km railway lines within Inner Mongolia are still under construction. This channel is set out to be the most convenient passage to link the East inlands of Inner Mongolia with Jinzhou Port and Panjin port, and is destined to drive regional economic cooperation.[19]

**50.** "Liaoning-Mongolia-Europe" Channel in Northeast China with its destination in Minsk Corrizic City in Belarus in May of 2017. Launching out once a week, the train cut the delivery time to 16 days, only 1/3 of the delivery time for waterway shipment. It's the third China-Europe freight train line along "Liaoning-Mongolia-Europe" Channel, the first China-Europe freight line passing through Erenhot along "Liaoning-Mongolia-Europe" Channel. It's a new expansion to the Middle Corridor after its launching of trains along the east rail line of "Liaoning-Manzhouli-Europe" Channel linking Panjin Port with Russia. Therefore, the international containerized multi-modal transport in Panjin is supported by multiple route options and two logistic channels.

### *3. "Liaoning-Bering Straits-Europe" Channel*

**51.** "Liaoning-Bering Straits-Europe" is a newly-opened sea route starting from Dalian port, bypassing Bering Straits and the Arctic Ocean to reach Europe. The merchant vessel "Yong Sheng" owned by COSCO Shipping has already returned from its maiden voyage from Dalian port to Rotterdam Port, passing Arctic routes and Europe's new economic and strategic channels. This route

[19] Liaoning has made breakthroughs in the integration of the three transport corridors into the" Belt and Road ", northeast news website: http://finance.nen.com.cn

has cut the transport mileage for the original 13,000 km Asia-Europe sea route by 8000 km, down by 35% in mileage and 30% in transport cost.

**52.** After its first sail, the merchant vessel set out again from Dalian port in May, 2017, passing the North Pole, and returned through the same route. Transport department in Liaoning is working to materialize a regular operation of the sea route that's adaptive to seasonal changes.

**53.** The establishment of the three international multi-modal transport channels have further facilitated trade and integrations with NEA, Far East Asia such as Russia, European countries, Japan and Korea. In early 2017, over 97.5% of the container freights in North East China are shipped to Japan, Korea and South Asia via Dalian port. The construction of the three channels have not only facilitated Liaoning in becoming the hub for sea-rail transport in NEA, but will also promote the opening up of North East China to a new height and provide new thinking for the revitalization of Northeast China.

### B. **Ports Connectivity between Liaoning and Europe**

**54.** Yingkou and Dalian ports have played the most key roles in enhancing connectivity between Liaoning and Europe by sea-rail multimodal transport. As an important port for Northeast China's opening up to the outside world, Dalian port has launched the Northeast No.1 train linking to Harbin as early as the year of 1996; it is the earliest to develop sea-rail transportation. Yingkou port caught up quickly and achieved remarkable progress both in waterway and railway by applying an innovative development modal.

**55.** Yingkou port spans from Yingkou, Panjin and Huludao and enjoys 5 harbor districts that cover 112 $km^2$ of land. It has recently injected investment in building up Shenyang port and Municipal logistical platform in Liaoning, aiming to develop a comprehensive logistical platform that combines all means of transportation such as waterway, railway, highway and air. The platform will facilitate the logistic interconnectivity among cities as well as urban and rural areas. Transport volumes by sea-rail model of Yingkou port has topped in China for many years, as the exported TEUs by the "Yingkou-Manzhouli-Europe" route have accounted for more than 90% of the total volumes in NE ports, 45% of the exported TEUs through Manzhouli port. Yingkou port has shipped a total of 526,000 TEUs in 2016, an 22% increase YOY; 33,000 TEU have been transported by "Yingkou-Manzhouli-Europe" freight lines departing from Yingkou

port, that's a 30.8% YOY increase, accounting for 51.3% of the total export volume of Manzhouli Port. [20]

**56.** As the only port that is not covered by government policy, Yingkou has the busiest direct train schedules providing international shipment services; it carried the largest freight volume from Southeast China through the land-bridge route. There's no doubt that it has become an important sea portal linking China and Europe, providing necessary routes along the Silk Road Economic Belt and Euro-Asia. China's first multi-modal transport pilot program – "Container Shipment by Highway-Waterway-Railway Multimodal Transport Program in Liaoning" is based in Yingkou. The program has opened up two logistical access from two directions, namely, a land corridor Yingkou port – Russia – Europe linking east with west, and a sea route Yingkou port – East China and NEA – South China, extending networks to Southwest China and ASEANs linking south with north, the latter of which requires in-depth cooperation with ports along the coast of South China, Yangtze river, Southwest China and ASEAN. The program aims to build Yingkou into a transit hub closest to North China and Europe.[21]

**57.** In terms of transport capacity, the sea-rail model of transport from Yingkou port is standing at 163, 000 TEU in Q1 2017, a 46.8% increase YOY; 8,300 TEU by China-Europe freight trains, a 59.9 % increase YOY. Yingkou has also tried some new development models. Enterprises led by Shen Ha Hong Yun Logistics Co., Ltd, have pooled in all possible resources and played very active roles in developing a sea-railway multi-model of development. [22] By relying on the strategic partnership with land ports such as Shenyang, Changchun and Harbin, it comes up with "five-fixed trains" and innovative transport model by combining railway lines with extensions, and shipment through multiple points, which has provided new ideas for the development of China Europe Freight Train routes. The company now provides direct lines setting out from Bayuquan to Manzhouli twice a week, which has become one of the efficient and stable logistic routes along the Silk Road Economic Belt.

**58.** Dalian has 100 berths for production use, including 74 berths for 10,000-ton-class or above. In 2015, it started cooperation with COSCO and opened up access to the Europe market by travelling through the North Pole sea route, bypassing Bearing Strait and reaching the North of Norway. The route will cut

[20] Port Intermodal Transport into a New Growth Point, China Port, Issue No. 4 of 2017

[21] Yingkou Port of Sea Rail Transport leads the Belt and Road, Northeast News Channel Yingkou: http://yingkou.nen.com.cn

[22] Li Xu: Sharp YOY Increase in Sea-rail Transport Volume in Q1 for Yingkou, Yingkou Daily on April 28, 2017.

the shipment time by 9 days and cost by 30% when compared to those of the traditional routes. It's indeed an express sea route across Artic Ocean.

**59.** Since 2016, Dalian port opened "Samsung Trains" and "Liaoning-Manzhouli-Europe Trains", which have been serving as multi-model transport options for shipping products like auto parts and components, mechanical equipment and daily commodities from Japan, Korea, South China, East China and North China to reach Europe. Now there are 50 container trains shipping out from Dalian port each week, forming up a distribution network for inland transportation reaching the 3 provinces in North East China and all borders of East Mongolia. Meanwhile, Dalian port is also moving forward with its transformation and upgrading. It attracted investment from FAW Group to become stockholders of the Dedicated Terminal for Automobiles in Dalian port. By doing so, it will become a key transit hub for shipping commercial vehicles of FAW by waterway, which will for sure stimulate another round throughput growth for the port. Dalian port has access to a number of international logistics routes such as "Liaoning-Manzhouli-Europe", "Liaoning-Bering Strait-Europe" and "Dalian-Harbin-Europe", accommodating to multiple ways of transportation such as by sea, railway and highway. Dalian port's annual transport capacity for sea-rail model has reached 406, 000 TEU, a 17% YOY increase. CR Intermodal is the only harbor station that can realize a seamless connection with the ports. Up till early 2017, Dalian Port Group has established nearly 80 international sea routes for container transport, connecting with more than 160 countries and 300 ports to facilitate trade. It has become one of the major transit and sea ports to carry out multi-modal transport.

### C. **Coordinated Development of Dry Ports and Sea Ports**

**60.** Although the development of dry port has started since 2013 in Shenyang, it's mainly serving as container warehouses and providing services in logistics, handling of shipments, container loading and unloading, maintenance and cleaning, etc. Covered an acreage of 100,000km$^2$, it can handle 250,000 TEU every year, and is the most equipped, advanced and well-managed modern dry port in Liaoning. Since its establishment, the port has been seeking a coordinated development with sea ports in Liaoning to become a distribution center and key juncture to connect with container rail lines for a balanced development of sea-rail service networks.

**61.** Given the context of the establishment of Liaoning FTZ and OBOR initiative, Shenyang municipal government has set up Shenyang Port Group Co. Ltd to better play the advantages of Shenyang's role as an international logistic center as well as Yingkou's geological location to form up a multi-modal transportation network that combines the land, sea and air. The land crossings will serve as the

exit of “Liaoning-Manzhouli-Europe” route, and Shenyang port for sea route transport and Xiantao airport for air freight.

**62.** The planning of Shenyang port has overcome regional constraints and incorporated more services into its business scope, which has provided a new model for inter-modal transport. It has shouldered more responsibilities from Yingkou port by providing freight forward services, direct contracts and orders and it plans to provide one-stop clearance services in the future. [23]Enterprises can finish all procedures with one-stop services provided by Shenyang port and logistic companies can load all cargos directly from railways and highway, and then ship them to more than 100 ports in 50 countries. By doing so, some of the seaport functions have been shifted to inland and Shenyang will function like a coastal city that can offer all sea port services. Quite a few features will be included into the development of Shenyang port, for example, a customs center to oversee multi-modal transport will be set up to provide custom supervision, which is still under construction. Shenyang port is also trying to integrate its development with innovations of the FTZ mechanisms by combining all resources of airports, railways, highways and the bonded areas covered by FTZ. Through the linkage with Yingkou and Dalian ports and OBOR railway lines, port functions and railway transport can be seamlessly connected.

**63.** Once completed, it will become a logistic platform integrating maritime shipment, railway, highway and airway, which will boost trade flows among China, Russia and Europe. It aims to become a well-recognized international trading, logistic, information and pricing center to stimulate a new round of economic development of the traditional industrial base.

### D. Development of Internet of Things of Sea Railway Model

**64.** The Internet of things (IoT) is the network of things based on internet technologies. Sea-rail multi-modal transport would require information sharing and operations not only between ports and railway stations but also quite a few entities such as shipping companies, cargo owners and supervision institutions. In 2011, Dalian along with the other 5 cities, Lianyungang, Qingdao, Tianjin, Shenzhen and Ningbo have co-applied for a pilot program of national Internet of things for sea-rail multi-modal transport. Both NDRC and MOF have approved the program in 2012.

**65.** As the earliest starters in developing sea-rail multi-modal transport in China and the first to apply IoT to intermodal transport in North East China, Dalian port has

[23] Shenyang and Yingkou Port Collaborated on Shenyang Port, Democracy and Rule of Law Website: http://www.mzyfz.com

more than 50 shifts of container freights each week, reaching out to traffic networks covering the “4 centers, 12 terminals and 31 stations” [24]in NE, and its TEU transport capacity by sea-rail multi-modal transport has been increasing and in a leading position around the nation. The IoT program started construction in July, 2014 in Dalian and went on trial in May, 2016, and then was approved and completed inspections by experts from Ministry of Transport in April, 2017. The program entails development of application systems, information sharing platform for sea-rail transport, data center, data collection system, supporting platform for applications and infrastructure of CPUs and storages, network safety systems. It built up an intelligent IoT platform by integrating smart technologies such as satellite positioning, one-stop services for custom declaration, coordination with checking stations and multi-modal transport and the inclusion of a “big data storage house” that collects all information of shipping bills, cargos, dock operations, railway companies, inland depots, train operators, supervision authorities. The platform will provide more coordination and better services by connecting Dalian port and containerized transport.

**66.** The IoT program greatly enhanced the efficiency and quality of sea-railway multi-modal transport, cut cost and improved customer services. Meanwhile, it provides services such as interconnected control of multimodal transport, categorizing commodities, analyzing of goods flow and assessing assembly and evacuation efficiencies of the port so that the port can make timely adjustments on market supply, operation flow analysis and planning on inland logistics according to real time data. It’s recognized not only as a demonstration for applying IoTs in national container sea-rail transport but also greatly promotes the development of Dalian port in becoming an international logistic channel under OBOR initiative. [25]

## E. Impact of Supporting Policies

**67.** Sea-rail multimodal transportation often means huge capital input, lengthy return and construction. It is to a certain extent, a public good. Thus, the developed countries in Europe and the United States, out of the interests of national and regional development, generally adopt a large number of strategies for financial support to stimulate the development of sea-rail multimodal transportation. With the proposed "Belt and Road" strategy, China is also aware of the importance of multimodal transport by sea and railways for promoting economic and social

[24] 2015 Maritime Transport in Dalian Port Ranks No. 1 in the National Coastal Ports, Port Economy Jan.2016

[25] Wang Jifu: Dalian Port Completes Northeast China's First Sea-Rail Combined Transport Internet of Things, Liaoning Daily, May 10, 2017

development. From the central government to local governments, various supportive policies and fiscal concessions have been proposed for the sea-rail multimodal transportation. However, through the analysis of the representative regional policies and systems, it can be found that the substantial supportive policies of our country for sea-rail multimodal transportation are still based on the local government level, and there is a lack of a unified top-level design. There are also many subsidized supportive policies based on departmentalism, which further aggravate the competition in the transport market between regions, and is not conducive to the optimization and development of the overall system of sea-railway transport.[26]

**68.** Through the analysis of extraterritorial experience, it can be found that the developed countries in Europe and the United States started the construction of sea-rail multimodal transportation in the early 20th century. And through the legislative, institutional financial support policies, as well as improving infrastructure and transportation networks, these countries have promoted sea-rail multimodal transportation. In terms of policy support, the New Jersey Port of New York in the United States has formulated a systematic and long-term subsidy policy to promote the rapid development of its sea-rail transport through joint financial support of the Port Authority and the federal government. As the once largest port in the world, the Rotterdam Port of the Netherlands is on the way of diversifying the modes of transport and modernization in terms of port construction. With the construction of Trans-European Transport Networks(TEN-T), the port has been improving multi-modal transport infrastructure such as railways, logistics parks and port areas, introducing government subsidy policies, attracting investors and actively exploring global markets. The sea-rail transport volume has increased significantly. It can be learned that the multi-modal transport in Holland is mainly subsidized by the port authority, which fully displayed the port's advantage in resource integration. It has also set up a company called Keyrail to specialize in carrying out all projects related to the promotion of sea-rail multimodal transport. Such commercialized subsidy has avoided direct intervention from government authorities to the market and provided targeted measures to achieve desired results.

**69.** For domestic sea-rail multimodal transport, in terms of the legal system construction, China has formulated laws and regulations on various modes of transportation. In terms of integrated transport system, it has also issued development plans and guidance measures such as the State Council's promulgation of the *" Opinions on the Healthy Development of Maritime*

[26] Tang Ning, Yang Jinglei: Comparative Study on Support Policies of Sea-Rail Transport at Home and Abroad, Port Economy, 2016-04.

*Transport Industry "," Medium and Long-Term Development Plan for Logistics Industry (2014-2020)* and *"Outline of the 13th Five-Year Plan",* etc. It is proposed to improve the modern integrated transport system, develop multimodal transport and cross-border multimodal transport aisle. However, there are still no designated laws and regulations on sea-rail multimodal transport, nor nationwide and systematic support methods and implementation plans for sea-rail multimodal transport. The supportive policies on sea-rail multimodal transport are still mainly comprised incentives and financial subsidies from local governments, which often are in lack of coordination.

**70.** Ningbo is the first domestic city which introduced supportive policies on sea-rail multimodal transport. The Ningbo Municipal Government issued the *Notice on the Issuance of Certain Opinions on Supportive Policies for Accelerating the Sea-rail Multimodal Transport Development for Ningbo Port (Revised)* in 2009, with an implementing term of three years. Its major subsidy policies are: subsidies to de-facto operators of sea-rail multimodal transport, "five-fixed" trains (i.e. fixed loading site, route, train number, schedules, and pricing), container services, shipping companies, eligible platforms with sea-rail multimodal public services. After this, in light of the status quo of Ningbo's sea-rail multimodal transport, Ningbo revised the policies in 2012 and 2015, which benefited Ningbo port greatly. Sea-rail transport volume grew from 1670 TEU in 2009 to 135,000 TEU in 2014, an increase of 80 fold (Table 4). As of April 2012, there were nine train lines regularly operating for container sea-rail multimodal transport in Ningbo Port, of which there were two lines for "five-fixed" trains and the other seven[27] for direct trains. Ningbo Port has established sea-rail multimodal transport with up to 20 cities and built 10 inland dryports, establishing itself as the largest port with sea-rail multimodal transport in southern China.

**Table 4 Container Throughput of Ningbo Ports by Multimodal Transport**

| Year | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|
| Volume<br>(10,000 TEUs) | 0.167 | 2.8 | 4.7 | 5.95 | 10.5 | 13.5 |
| Year-over-year growth percentage | | | 67.9% | 26.6% | 76.5% | 28.6% |

[27] Tao Xuezong, Zhang Rong: Experience and Enlightenment of Ningbo Port Container Sea-Rail Joint Transport Development, Integrated Transportation, June of 2012.

**71.** Compared with developed countries, subsidies for sea and railway transport in Ningbo reflect the main features of China's supportive policies, namely, the lack of legal guarantee for supporting policies and overall planning in local policies. In addition, China's sea-rail multimodal transport is not highly marketized. The port's function is not differentiated or targeted. Direct government subsidies are likely to cause vicious competition among ports, which is not conducive to the overall development of China's sea-rail multimodal transport.

**72.** Among the sea-rail multimodal transport in Liaoning Province, the subsidy policy in Dalian is most transparent. Dalian Municipal Government issued the "Implementation Rules for Subsidy Funds for Dalian Port Container Development in 2014-2015" with a term of 2 years. Subsidy policies include subsidies for the operating companies or logistics companies that have reached the transport capacity, toll subsidies for the towing companies, and subsidies for the construction of the pier.

**73.** In 2015, Dalian ranked the first in terms of sea-rail multimodal transport volume in the country with a total of 349,000 TEUs, of which the cross-border container traffic volume increased by nearly half as compared with the same period of last year. In sharp contrast, the volume of cross-border containers traded in Tianjin Port dropped by 35% over the same period. Of course, Tianjin Port has its own disadvantages such as aging infrastructure construction, insufficient transport capacity and poor information exchange. However, it is clear that non-market competition plus regional policy support is not conducive to the sound development of sea-rail multimodal transport in the northern ports. In Liaoning Province, there are also competitions among the ports. Similar geographical advantages and supplies mean that the ports of Liaoning Province lack their own competitive advantage, so that they rely solely on subsidies from the cities which easily lead to vicious competition. Therefore, the development of sea-rail multimodal transport in Liaoning Province requires a macro-management coordination mechanism. Meanwhile, it is necessary to coordinate the overall planning and management of governments, establish an integrated transport system, and enhance cooperation between ports. Excessive vicious competition causes losses to both sides, while cooperation brings about a win-win situation. Despite its geographical advantages, Yingkou Port is a shallow water port, where foreign trade ships cannot berth. Frozen sea surface in winter makes Yingkou Port available only to near-ocean routes and domestic secondary routes, which is a salient disadvantage in this regard. However, Dalian Port is an ice-free port all year round, with a number of offshore routes and ocean routes. It can act as a transit port for large vessels to Yingkou Port. Hence, scientific planning, policy support, and close cooperation among all

ports, railway divisions and related parties are the key to tap the potential of Liaoning sea-rail multimodal transport.

### F. Index Table of Policies Listed in III

| No. | Name | Release time | Release agency |
|---|---|---|---|
| *1* | *China-Russia Economic Corridor Construction Plan* | *2016* | *National Development and Reform Commission* |
| *2* | *Implementation Opinions on Liaoning-Manzhouli-Europe Channel* | *2015* | *Liaoning Provincial Department of Transportation* |
| *3* | *Dalian International Logistics Center Construction Plan (2016-2020)* | *2009* | *Dalian Municipal Government* |
| *4* | *Highway Law of the People's Republic of China* | *2017* | *National People's Congress* |
| *5* | *National Expressways Network Plan* | *2004* | *The State Council* |
| *6* | *National Plan for Inland Waterways and Ports* | *2007* | *Ministry of Communications* |
| *7* | *Concerning the Promotion of the Healthy Development of Marine Industry* | *2014* | *The State Council* |
| *8* | *Medium and Long-Term Plan for the Development of the Logistics Industry (2014-2020)* | *2015* | *The State Council* |
| *9* | *Notice on the Issuance of Certain Opinions on Supportive Policies for Accelerating the Sea-rail Multimodal Transport Development in Ningbo Port (Revised)* | *2009* | *People's Government of Ningbo* |
| *10* | *Measures for Accelerating the Implementation of Financial Supportive Policies for the Sea-rail Multimodal Transport Development in Ningbo Port* | *2015* | *People's Government of Ningbo* |
| *11* | *Method of Financial Support for Accelerating the Construction of the Northern International Shipping Centre in Tianjin Binhai New Area* | *2010* | *People's Government of Tianjing* |
| *12* | *Implementing Regulations for the Dalian Port Container Development Subsidies (2014-2015)* | *2013* | *People's Government of Dalian* |

## IV. Influence on Sea-Railway Models

### A. National Initiatives and Policies

#### *1. OBOR*

**74.** Embracing the trends toward a multipolar world, economic globalization, cultural diversity and greater IT application, the OBOR initiative is designed to uphold the global free trade regime and an opening world economy in regional cooperation. The construction of interconnected infrastructure is prioritized in the initiative. The participating countries should increase the integration of their infrastructure construction plans and technical standard systems, and jointly push forward the construction of international backbone corridors to gradually form an infrastructure network connecting all sub-regions in Asia and between Asia, Europe, and Africa. The development of regional multimodal transport shall focus on the key passageways, junctions and projects, and give priority to linking up unconnected road sections, removing transport bottlenecks, advancing road safety facilities and traffic management facilities and equipment, and improving road network connectivity. In addition, it's important to include below measures when promoting multi-modal transport, ranging from promoting a unified coordination mechanism for all legs of transportation to increase smooth operations from customs clearance, reloading and multimodal transport between countries; gradually formulating compatible and standard transport rules to facilitate international transport; pushing forward port infrastructure construction; building smooth land-water transportation channels to advance port cooperation; increase sea routes and the number of voyages; enhancing information technology cooperation in maritime logistics; expanding and build platforms and mechanisms for comprehensive civil aviation cooperation; and speeding up the development of aviation infrastructure[28].

**75.** The strategic initiative to build the New Silk Road Economic Belt and the 21st Century Maritime Silk Road reflects the common needs of the countries along OBOR and provides a new platform for international cooperation. Located in the heart of Northeast Asia and as the only coastal province along the border in northeast China, Liaoning province is an important gateway to the sea connecting Asia and Europe and plays an important role in the implementation of the OBOR initiative. Supported by the coastal ports and sea-rail multimodal transport, the Russia-Mongolia-China economic corridor provides an important platform for Liaoning province to participate in the OBOR initiative.

[28] Visions and Action Plans in Promoting a Silk Road Economic Belt and the 21st Century Maritime Silk Road

**76.** The guiding documents formulated by Liaoning Provincial Party Committee and people's government regarding the plan to implement the OBOR initiative (in the area of transport) mainly include the following two: *Implementation Plan for Liaoning Province's Participation in the "One Belt, One Road" Initiative* and *The 13th Five-Year Plan for the " One Belt, One Road " Initiative in Liaoning Province*. These two documents lay out the overall plan for Liaoning to fully participate in the OBOR initiative. Liaoning provincial government should accelerate the construction of the "Three Main Channels" in carrying out the OBOR initiative. Relying on the Russia-Mongolia-China economic corridor, firstly Liaoning shall speed up the development of Dalian Northeast Asia International Shipping Center to develop the important sea passage" "Liaoning-Bering Strait-Europe" (Liao-Hai-Ou) from the Dalian port, bypassing South China Sea to Indonesia and the South Pacific regions, and finally reach Northeast Passage in the Arctic Ocean through Bering Strait. Second, develop Liaoning-Manzhouli-Europe (Liao-Man-Ou) logistics passage with the Port of Dalian and the Port of Yingkou as the starting point, and Liaoning-Shandong Land-Sea Drop and Pull Transport Channel as the trunk line to integrate the function of the two ports. Third, build Liaoning-Mongolia-Europe railway passage that runs from Jinzhou port and Dandong port to Choibalsan in Mongolia and further goes to Europe. The purpose to build the "Three Main Passages" is to promote trade and investment with cross-border logistics transport.

### *2. Northeast China Revitalization Plan*

**77.** In October 2003, The Opinions of the Central Committee of CPC and the State Council on the Implementation of Revitalization Strategy of the Traditional Industrial Bases in Northeast China clearly put forward the strategic plan of " Making full use of existing port conditions and advantages to build Dalian into an important international shipping center in Northeast Asia " Based on this national strategic plan, the national, provincial, and municipal governments have issued a number of documents over the past decade in succession to support the development of Dalian Northeast Asia International Shipping Center.

**78.** In August 2004, to speed up the building of Dalian Northeast Asia International Shipping Center, Liaoning provincial government and Dalian municipal government separately issued opinions on the detailed implementation, which include five basic backbone documents, namely *The Decision of Liaoning Provincial Party Committee and Provincial Government on Speeding up the Building of Dalian Northeast Asia International Shipping Center*, *The Opinions of Liaoning Provincial People's Government on Accelerating the Development of Coastal Ports*, *The Development Plan of Dalian Northeast Asia International Shipping Center*, *The Opinions of Dalian Municipal People's Government on*

*Accelerating the Building of Dalian Northeast Asia International Shipping Center*, and *The Opinions of Dalian Municipal People's Government on Implementing the Development Plan of Dalian Northeast Asia International Shipping Center*. These five backbone documents involve 16 areas, including port planning, integration of port resources, port infrastructure construction, policies on land and sea, investment and financing system, government fiscal and tax support, construction of distribution channels, concession of freight rates, construction of dry ports, development of shipping service industry, supporting services, expanding modern logistics, improving port environment, building free trade port area, development of information resources, and leadership support. The documents state that "special importance should be given to the participation of enterprises and capital in northeast China in the building of Dalian Northeast Asia International Shipping Center and special attention should be given to the economic and trade exchanges and cooperation with Northeast China to provide services and guarantee for the smooth flow of resources and production factors in northeast China." According to the documents, it is necessary to improve the construction of hardware facilities and transport channels of sea-rail multimodal transport in accelerating the modernization of the transport system to vigorously develop Eurasian Land Bridge, start by upgrading the software and hardware facilities and creating sound customs clearance environment to build Dalian port into an international shipping center that meets the needs of an international shipping center in Northeast Asia, which will be a huge impetus to the economic development of Northeast China. In order to become an international shipping center in Northeast Asia, Dalian port must rely on the economic development of the hinterland, increase its development of the hinterland market in northeast China, improve its logistics service, and change the mindset to provide a convenient and efficient logistics platform according to customers' needs. The decision to build Dalian Northeast Asia International Shipping Center has played a positive role in promoting the development of sea-rail multimodal transport of Dalian port. In addition, agencies such as the National Development and Reform Commission of the People's Republic of China, General Administration of Customs, Ministry of Finance, and Ministry of Transport have all issued specific policies to support the construction of the international shipping center in Dalian. Dalian Dayaowan Bonded Port Area was established with the approval of the State Council. The *Dalian Northeast Asia International Shipping Center Development Plan* was the first international shipping center plan approved by the state. *The Master Plan of Dalian port* was approved by the state for implementation. Dalian municipal government has successively put forward over 20 laws and regulations such as the *Plan of the Shoreline of Dalian Port*, and the *Development Plan of Shipping Industry in Dalian*, which have formed the new port synergetic development pattern "Three Cores with Two Wings" with the

harbor areas of Dayaowan, Changxing Island, and Taipingwan as the cores and the Yellow Sea and Bohai Sea as the wings.

**79.** In August 2014, the State Council issued *The Opinions of the State Council on Major Policy Measures for Supporting the Revival of Northeast China in the Near Future* and stressed: "to speed up the building of an international shipping center for Northeast Asia in Dalian " During his visit to Dalian, Mr. Xi Jinping, the General Secretary of CPC emphasized that Dalian should be built to "a pilot zone for optimized industrial structure and a forerunner of economic and social development. " Mr. Li, Xi, governor of Liaoning province, also pointed out that: "we will take the lead in building an international shipping center for Northeast Asia". The ardent care and high expectation of the CPC and the government have made the goal and task of building an international shipping center for Northeast Asia in Dalian clearer. With the guidance of the grand blueprint, a new round of the development of international shipping and logistics centers has come at an accelerating pace.[29]

### *3. Liaoning's FTZ Planning*

**80.** Established at the beginning of 2017, Liaoning Pilot FTZ will improve the overall competitiveness of and further open up the old industrial bases in northeast China. The goal of this FTZ is to nurture a cluster of high-end industries with investment and trade facilitation, robust financial services, and effective and sustainable oversight in a legally compliant environment. It consists of three sub-zones: Shenyang area, Dalian area, and Yingkou area. According to the function planning, Yingkou area is positioned to develop into a hub for international sea-rail multimodal transport channel.

**81.** The State Council's policy on Liaoning Pilot FTZ: the *Overall Plan for the China (Liaoning) Pilot Free Trade Zone* issued by the State Council proposes to build a sea-land-air route connecting Asia and Europe. Relying on the FTZ, Liaoning should accelerate the construction of Dalian Northeast Asia International Shipping Center and push forward the construction progress of sea-rail multimodal transport in Yingkou port and the cross-border railway in Shenyang. In addition, efforts should be made to speed up the development of inland port in Shenyang, support the establishment of a customs supervisory center for multimodal transport, and build Shenyang-Yingkou land-sea multimodal transport system. Liaoning should support the FTZ to carry out cooperation and exchanges

[29] Dalian Port and Port Bureau official website:
http://www.gkj.dl.gov.cn/behavior/article.php? COLLCC = 3510341569 & id = 15031113413484 & zid = 42

on customs, inspection and quarantine, certification and accreditation, and standard measurement with participating countries of “One Belt, One Road” and to explore cooperation with these countries on the safety and facilitation of trade supply chain.

**82.** Liaoning provincial government expressed that the launch of Liaoning Pilot Free Trade Zone will further expand international cooperation in Northeast Asia, and promote the construction of Dalian Northeast Asia International Shipping Center, the sea-rail multimodal transport in Yingkou port, the cross-border railway in Shenyang and Shenyang-Yingkou land-sea multimodal transport system. In addition, the FTZ will also help build multi-port joint development system and an aviation logistics hub to achieve the joint development of sea, land and air transport. Liaoning Provincial Development and Reform Commission stated that it would advance the building of “Liaoning-Manzhouli-Europe”, “Liaoning-Mongolia-Europe” , and “Liaoning-Bering Strait-Europe” channels, coordinate in pushing forward the construction progress of different railway sections of “Liaoning-Mongolia-Europe” railway inside China, support the shift of Yingkou port from a port of destination to a transit port, support the addition of new container trains between China and Europe, and plan to add international routes for relevant ports and daily domestic routes for major domestic ports. Liaoning Provincial Department of Commerce stated that it will speed up the construction of multimodal customs supervisory center and support Dalian and Yingkou to develop land-rail and sea-rail multimodal transport between Asia and Europe to increase the international competitiveness of logistics enterprises.

## B. Internet Plus and Technological Development

### *1. Influence on Transportation and Logistics*

**83.** The study team analyzed the influence of Internet Plus and technological development on traditional logistics, supply chain, marketing and private enterprises.

#### *a) Influence on Traditional Logistics*

**84.** Internet Plus and technological development can optimize the construction of logistics infrastructure and save cost, integrate resources and effectively promote in-depth collaboration of logistics with other industries, promote the elements of logistics functions to become intelligent and information-based, and improve the logistics service quality and promote the transformation of logistics service from being reactive to proactive to customer requirements.

#### *b) Influence on Supply Chain*

**85.** Supply chain generally includes four processes: material flow, commercial circulation, information flow, and capital flow. The Internet is one of the most popular communication platforms today. Its introduction has greatly facilitated the supply chain management.

**86.** The Internet promotes the realization of information sharing mechanism. The Internet is conducive to the integration of enterprise cultures and the establishment of cooperation mechanism. [30]The Internet strives for symmetrical information to facilitate smooth and stable supply chain management. The supply chain gradually extends the concept of being need-driven to how to interact with customers to deeply understand and serve them.[31]

### *c) Influence on Marketing*

**87.** The introduction of Internet Plus into marketing has greatly compressed and simplified the traditional marketing process, effectively decreased the marketing cost, sped up the marketing process, increased marketing precision, and enormously improved marketing efficiency, which are changes brought by Internet Plus to the traditional marketing. At the same time, the real-time nature of Internet Plus enables interactive communication of marketing to become a reality and customers become the leader in marketing. They actively participate in enterprises' processes of marketing research, product production, and end service. Customers gradually become the research and strategy implementer to realize zero-distance contact among enterprises' production activities, market needs, and marketing. In short, the main influences of Internet Plus on marketing are the switch to the dominant position of customers and the qualitative changes of the function of marketing.

### *2. Policy Context*

**88.** Internet Plus refers to the process of diffusion, application, and integration of the new generation of Internet-based information technologies (including mobile Internet, cloud computing, big data, IOT, etc.) in various areas of economy and society. Transport industry is one of the industries with early, deep, and wide influence from mobile Internet.

**89.** In 2013, the Ministry of Transport of the People's Republic of China issued the *Guiding Opinions on Promoting the Development of Information-Based and Intelligent Transport*. In order to achieve standardized and orderly transport

[30] Chen Hui: Internet's impact on supply chain management mechanism, China Business Issue. No.18,2011.

[31] Wang Jing: Internet + marketing model innovation, Modern Marketing, 2015 the tenth period.

development, the Ministry of Transport formulated and published the *Form of Transport Informatization Standard System* and the first lists of transport informatization standards to be strictly followed and formulated and revised a series of industry-based standards such as *Basic Data Element of Transportation Information*. In 2015, the State Council issued the *Guiding Opinions on Actions Actively Promoting Internet Plus*, which puts forward 11 specific operational tasks including building efficient Internet Plus logistics and convenient Internet Plus transport. The *Opinions* states: " it is imperative to accelerate the construction of cross-industrial and cross-regional logistics information service platform, improve logistics supply-demand information connectivity and the use efficiency of this information, encourage the application of big data and cloud computing in logistics, build intelligent warehousing system, optimize logistics operation process, improve automation, intelligent level and operation efficiency of logistics warehousing, and reduce the cost of logistics." " Initiatives should be taken to use technologies such as the Internet of things and mobile Internet to further collect information on the operating conditions and traffic of key facilities in the transport network of highways, railways, civil aviation, and ports, support cross-regional information connectivity of different types of transport, promote the application of intelligent technologies such as the Internet of vessels and the Internet of vehicles, form a more complete transport sensing system, improve the Internet connectivity of factor resources such as infrastructure, transport tools, and operation information to provide full support for failure warning, operation and maintenance, and intelligent scheduling." The Ministry of Transport responded promptly to the tasks laid out by the State Council with the issuance of the *Guiding Opinions on Taking the Lead of Economic and Social Development under the "Four-Pronged Comprehensive Strategy*". In this document, the Ministry of Transport clearly states to promote the innovation of new Internet Plus transport forms and modes. In 2016, the Ministry of Transport successively issued the *Implementation Opinions on Promoting the Openness and Sharing of Data Resources in the Transport Industry*, the *Guiding Opinions on Promoting the Network Security in the Transport Industry*, and *the 13th Five-Year Plan for Transport Informatization*.

### 3. ***Case Studies***

**90.** The study team selected the following six ports in China to analyze the influence of Internet Plus and technological development on sea-rail multimodal transport.

Case 1: Qingdao Port

**91.** Based on a variety of advanced information technologies such as Internet of Things, cloud computing, big data and mobile internet, a cloud-based logistics e-commerce service platform was set up. Based on the cloud platform architecture,

intelligent logistics management systems for the port dry bulk, liquid bulk cargoes, container long distance road transport, sea transport warehouse booking, and shipping supply are established. This has attracted a large number of logistics enterprises both inside and outside the port to launch new logistics services through the platform and information system. A full range of online services as the main characteristics of port logistics e-commerce ecosystem is set up.[32]

Case 2: Humen Port

**92.** Humen port has used the new generation of information technology to achieve the comprehensive upgrading of port O2O cross-border e-commerce. Information industry and modern logistics industry are closely integrated. An electronic data exchange and sharing platform has been established among relevant parties including government agencies, inspection agencies, shipping companies, customs clearance, and enterprises. At the same time, logistics, capital flow, and information flow are integrated to help businesses reduce the cost of logistics and to improve information utilization level of the whole port area.

Case study 3: Shanghai Port

**93.** Develop e-commerce service system for Shanghai port, enhance online service capability, and implement its Yangtze River Strategy, Northeast Asia strategy, and Internationalization Strategy with the O2O management platform.

Case study 4: Lianyungang Port

**94.** Lianyungang port uses smart phones and various types of industrial mobile terminals to serve production and operation of the port. In terms of terminal production, its self-developed business management information system for large-sized general cargo terminals has further expanded and greatly improved the efficiency of general cargo terminal production scheduling.

Case 5: Ningbo Port

**95.** Ningbo port has integrated five sub-systems to share data, including the original freight waybill system, loading and unloading system, and wireless transmission system of train marshaling, which has achieved information-based and connectivity-based business operation and on-site control in sea-rail multimodal transport and data sharing with the national railway system,

[32] http://www.qingdaochina.org/index.php?m=content&c=index&a=show&catid=14&id=24505。

shipping companies, and related entities. At the same time, concepts such as the Internet of things and bid data have also been used to give play to the port's function of connectivity.

Case 6: Rizhao Port

**96.** Rizhao port has independently developed a set of management systems with the integration of information technologies such as GPS positioning, wireless communication, logistics network, and mobile Internet. Through the system, big data is shared, the service chain is extended, and information exchange platform is built to achieve two-way information communication. The use of "logistics documents" under e-commerce is being promoted for cargo information inquiry and tracking.[33]

### *4. Influence of Internet Plus and Technological Development*

***97.*** Internet Plus and technological development has advanced the development of policies and regulations for the integration of the Internet with transport and logistics in Liaoning province. In December 2015, Liaoning provincial people's government issued the *Action Plan to Actively Promote Internet Plus in Liaoning Province*. Article (VII) puts forward opinions on how to implement highly efficient Internet Plus logistics as follows: "(1) Build the system of provincial logistics public information platform. Preference should be given to a logistics information platform of a certain scale to improve its functions and role to provide logistics public information services to the whole province so that it can share information and connect with the information systems of administrative departments of various industries, public information of inter-city logistics, and the information system of logistic enterprises. Logistics public information systems at the city level should be constructed scientifically to improve the system of provincial logistics information platforms. (2) Improve the system of logistics and distribution services. The service procedure of express delivery businesses should be regulated to improve express delivery speed and service quality. An urban express delivery network should be built to be able to cover the whole province, reach the whole country and gradually expand to county-level cities and major towns to build the management and service system of logistics express delivery adaptive to the e-commerce development of the province. Third-party logistics should be developed vigorously, and the fourth-party logistics should be promoted to develop external, organized, and information-based logistics and distribution. The business model of e-commerce logistics and distribution should be innovated to coordinate development of e-commerce and logistics express delivery. Support should be provided to e-commerce enterprises and

[33] Case 2 to Case 6 referred to Cao Lei: Era of Internet Plus and Port logistics, http://www.100ec.cn/detail--6255058.html

merchandising businesses to jointly build logistics facilities for warehousing and distribution for highly efficient and smooth e-commerce distribution network. Support should also be given to city communities to set up online shopping express delivery sites. (3) Speed up the construction of Liaoning regional exchange node for national transport and logistics platform (Liaoning provincial transport and logistics public information service platform). All kinds of information resources should be aggregated to increase connectivity between the provincial platform with freight hub stations, port terminals, and logistics parks. Key logistics enterprises are encouraged to set up society-oriented interconnectivity application system or platform with third-party agencies to integrate information about warehousing, transport, and distribution. Efforts should be made to promote the building of passenger transport vehicles system and small package express delivery system. Liaoning's function as a regional exchange node should be utilized as a platform to support data exchange and settlement. Efforts should also be made to promote the construction of multimodal transport system, connect logistics information chain, and enhance the interconnectivity application of multimodal transport. (4) Give play to the leading role of leading Internet enterprises in innovation. Efforts will be given to promote the popularization and application of technologies such as mobile Internet, satellite positioning and navigation system, RFID, and IC card electronic license, encourage the development of freight APPs and the innovation of operation and service modes such as freight loading, tracking and traceability, and cultivate some third-party leading logistics enterprises with mobile Internet technology as their core competitiveness".

**98.** In 2016, in order to thoroughly implement the *Opinions of the General Office of the State Council on In-depth Implementation of the 'Internet Plus Circulation' Action Plan* (No.24〔2016〕 of the General Office of the State Council), Liaoning province issued the *Action Plan to Implement Internet Plus*, which puts forward the need to: strengthen the infrastructure construction of intelligent circulation. It is imperative to increase the policy support to the construction of logistics bases and cold-chain system, etc., make scientific planning and layout arrangement of logistics bases, distribution centers, public delivery centers, and terminal delivery networks in the province, increase the input in circulation infrastructures, support the construction of cold chain system for the whole circulation of agricultural products, and focus on the refrigerator construction in major national agricultural production areas. It is necessary to increase the input in the broadband construction in rural areas, extend fiber broadband and mobile network to every village, accelerate the process of speed increase and fee reduction, and eliminate the "digital gap" between urban and rural areas. Further efforts shall be made to make information-based transformation of circulation infrastructures and make full use of the Internet of things and other new technologies to push forward

the construction of intelligent logistics and distribution system, and improve the utilization of cold-chain facilities in the whole province. It is necessary to build demonstration logistics system to develop the logistics professional and public information service platform of Liaoning province, promote advanced delivery model, integrate various types of logistics resources, and encourage the innovation of logistics technology, management, form, and services to improve logistics efficiency and lower logistics cost. It is imperative to promote the coordinated development of e-commerce and logistics express delivery in Dalian province as a pilot city, make timely summary of the pilot results of the coordinated development, form the system, practices and experiences that can be replicated and popularized. It is imperative to explore to build the logistics express delivery management and service system adaptive to the rapid development of e-commerce, make efforts to solve the difficult problems such as standardized traffic of express delivery vehicles, terminal delivery, and the training of e-commerce express delivery professionals in basic skills, and shore up wink links in the development of e-commerce logistics.

**99.** In practice, there has already been construction and application of Internet Plus logistics – Dalian Port. Dalian Port is the earliest to develop sea-rail combined transport in the country. Sea-rail container transport has been growing rapidly and ranked the top in the country. The use of Internet of things is to connect things through the Internet. Sea-rail multimodal transport is not just about information sharing and work coordination between the port and railway; it also involves many other parties such as shipping enterprises, cargo owners, and regulatory agencies. In 2011, Dalian along with the other 5 cities, Lianyungang, Qingdao, Tianjin, Shenzhen and Ningbo have co-applied for a pilot program of national internet of things for sea-rail multi-modal transport. The IoT program was approved and completed inspections by experts from Ministry of Transport in April, 2017. On June 8, 2017, the General Office of the Ministry of Transport issued the *Notice on Publishing the List of Smart Port Demonstration Projects and Relevant Matters*, which published 13 smart port demonstration projects in 10 provinces (autonomous regions and municipalities), the first of which Is Dalian Port "Yi Gang Tong" smart logistics cross-border services platform demonstration project. It built up an intelligent IoT platform by integrating smart technologies such as satellite positioning, one-stop services for custom declaration, coordination with checking stations and multi-modal transport and the inclusion of a “big data storage house” that collects all information of shipping bills, cargos, dock operations, railway companies, inland depots, train operators, supervision authorities.[34]

[34] Wang Jifu: Dalian Port to Build the First Sea-rail Transport in Northeast Internet of things, Liaoning Daily.

## C. The Role of Private Capital

**100.** Encouraging the involvement of private capital in the transport sector is one of our current policies. According to the *Several Opinions of the State Council on Encouraging and Guiding the Healthy Development of Private Investment*, the state will give private capital more freedom and bigger development room. At present, the areas where private capital is involved in seaport transport include the three major areas of transport infrastructure, transport services and emerging transport industries.

### *1. Transport Infrastructure Related with Sea-rail Multimodal Transport*

**101.** Transport infrastructure related with sea-rail multimodal transport includes roads, waterways (locks), ports, hubs (stations), railways, and civil aviation airports. Inland waterways have the features of public goods and are more difficult to access by private investors. Railways, especially inter-city railways, are the key projects for private capital advocated by the state in recent years. However, comprehensive transportation hubs, passenger and cargo transportation stations, civil aviation airport are the key areas for absorbing private capital; ports are invested mainly by enterprises. So they are highly marketized. Private capital more willing to enter.[35]

### *2. Transport Service Industry*

**102.** Generally speaking, transport service projects are ordinary competitive projects. As water passenger and freight transport has already enjoyed relatively high level of market-based operation and better rules and regulations, it has already been fully opened to private capital in passenger and freight transport by waterway and auxiliary transport. Because of incomplete reform of investment and financing system and the special requirement in operation and management in rail transport, there still will be some difficulties for full access of private investment within a certain period of time in the future.[36]

### *3. Emerging Transport Industry*

**103.** Emerging transport industry includes intelligent transport, modern logistics, traffic information services, energy conservation and emission reduction in transport,

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[35] Tang Ren, Sun Huaqiang: Transportation Sector to Introduce Private Capital into the Field and the Main Ways to explore, Transportation Accounting and Financials, Issue.No.8, 2012.

[36] Tang Ren, Sun Huaqiang: Transportation Sector to Introduce Private Capital into the Field and the Main Ways to explore, Transportation Accounting and Financials, Issue.No.8, 2012.

etc. Similar to high-tech industries, emerging transport industries are ordinary competitive industries. At present, the country has introduced a number of policies to promote Internet Plus efficient logistics, Internet Plus Convenient Transportation. So intelligent technologies like IoT transport are the future development directions of transport. As the development of high-tech industry is market-oriented, private capital has become the main investment in this field. The emerging transport industry has huge development and investment potential. Therefore, it is a key transport area to introduce private capital.[37]

### *4. Case Studies of Private Investment in Transportation*

**Case**

**I. Beijing Subway Line 4**

**104.** Beijing Subway Line 4 is a major rail transit line in Beijing's mass transit network. The 28.2 km-long subway line, with a total investment of 15.3 billion yuan, runs from north to south of the city. The whole project was divided into two parts, namely Part A and Part B. Part B mainly covers metro vehicles, signal, vending system and other mechanical and electrical equipment. Part B's investment capital reached about 4.6 billion yuan, accounting for 30% of the total, and was financed and built by the Beijing MTR Corporation, or BJMTR (a three-way Joint Venture among the Hong Kong MTR Corporation, the Beijing Capital Group (BCG), and the BIIC that acts on behalf of the government side).

**105.** The Beijing municipal government has also awarded the JV a concession to operate and manage Line 4 for 30 years. Expenditures for BJMTR include: the construction of Part B, lease payment of Part A to Beijing Metro Line 4 Co., the maintenance of all facilities (including both Part A and Part B) and the replacement of all assets except for the tunnel. The revenue of BJMTR includes: fares and income generated from other commercial activities within the station.

**106.** The Beijing municipal government may adjust BJMTR's lease payment of Part A based on the ridership. In case that the passenger flow is lower than expected and fares income decreases, the rent will be lowered to make up the loss of BJMTR; otherwise, the rent will go up to avoid an excess profit scenario. When the 30-year concession period expires, BJMTR will return the facilities of Part A to Beijing Metro Line 4 Co., and transfer the well-preserved facilities of Part B voluntarily to the designated agency of the government.[38]

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[37] Tang Ren, Sun Huaqiang: Transportation Sector to Introduce Private Capital into the Field and the Main Ways to explore, Transportation Accounting and Financials, Issue.No.8, 2012.

[38] 21CN News: Beijing Metro Line 4 PPP Project, http://news.21cn.com/caiji/roll1/a/2014/0819/07/28049931.shtml

### Case II. Fuling-Fengdu Highway in Chongqing

**107.** Chongqing Fuling-Fengdu Highway, with a total length of 46.5 kilometers, is a major component of Chongqing's highway network. Its total investment was 4.179 billion yuan, and the project won the approval in 2008. The construction was commenced in June 2009 and was open to traffic in 2013. The bidding was launched in April 2008. Road & Bridge International Co., Ltd. won the bidding and was awarded the investor in the mode of "BOT+EPC". As authorized by the Chongqing municipal government, the Chongqing Municipal Commission of Transportation signed an investment agreement with the bid-winner in August 2008. Both sides agreed that the investor shall be responsible for the investment, construction, operation and management of the project according to the master plan and government demands. After the signing of the investment agreement, the investor then set up a company in accordance to the clauses as listed in the agreement to fulfill its obligations. With the authorization of the municipal government, the Chongqing Municipal Transportation Committee signed a concession agreement with the company in May 2009, granting the company the right to invest, construct, operate and manage the Fuling-Fengdu Highway. The company is expected to fulfill duties including examination and approval, proactive design, land acquisition and demolition, financing and construction of the project.[39]

### Case III. Phase II of Shenzhen Metro

**108.** The construction of the Shenzhen Metro consists of Phase I, II and III. Phase I was fully financed by the government, with 70% of the investment capital coming from the municipal government and the remaining 30% from bank loans. In 2007, the PPP model was first introduced to Phase II subway expansion, making the government and social capital each account for 50% of the total investment. Private enterprises repaid bank loans through the development of superstructure property, such as vehicles. The government contributed to the construction financing through directed use of land premiums. Take the operation model of Qianhai Station as an example. In 2008, three properties of Qianhai Station were open for bidding, auction and listing. The Shenzhen Metro Group (SZMC) won the bid, it then raised 1.74 billion yuan of land premium from the SASAC. The premium was then transferred to the municipality's fiscal department, and then to the SASAC in the same day to enable the SASAC to put the money to the SZMC. The SZMC thereof gained the right to land use for the purpose of attracting market capital for the subway construction.

[39] Sohu.com: Development and Reform Commission announced the 13 Cases of Typical PPP projects, http://www.sohu.com/a/146188466_615137.

### Case IV. Hangzhou-Shaoxing-Taizhou High-speed Railway

**109.** On December 23, 2016, the Hangzhou-Shaoxing-Taizhou High-speed Railway was formally commenced in Taizhou. The 269-km railway was designed with a speed of 350 km/h, and the total investment is about 44.9 billion yuan. The China Railway Fifth Survey and Design Institute Group Co., Ltd. was responsible for the survey and design of the project, which is among China's first public-private partnership (PPP) funded high-speed railways. According to the PPP financing framework, the project will be co-funded by private capital (accounting for 50% of the total), State-owned China Railway, Zhejiang Communications Investment Group and local government. In September 2016, a PPP cooperation agreement was signed between the Zhejiang Communications Investment Group and three private firms, namely the Fosun Group, the Geely Holdings Group and the Wanfeng Auto Holdings Group. It was agreed that the railway shall be jointly financed and constructed by Zhejiang Communications Investment Group, Taizhou City, Shaoxing City, private capital and China Railway, and shareholdings by private capital is acceptable. The Fosun Group, which financed the construction of the railway, is a large investment group whose main businesses include investments in health and medicine, real estate, steel, mining, retail, cultural and service industries; the Geely Holdings Group, an auto making and operation company, is a local private enterprise, and became famous after its acquisition of Volvo; the Wanfeng Auto Holdings Group, a local private enterprise in Shaoxing, is mainly active in auto parts industry, machinery and equipment, financial investment, etc.[40]

**110.** In short, private capital's introduction into the sea-rail multimodal transport industry is conducive to expanding funding channels and enhancing sea-rail multimodal transport industry's sustainable development ability. This will help to promote the development of the sea-rail transport industry combined with smart technology, reduce the cost of rail-sea multimodal transport and improve the efficiency. It is also conducive to improving the transportation service system and promoting better and faster development of sea-rail transport in Liaoning Province.

[40] Overseas.net: China's First Private-owned Holding Hangzhou-Shaoxing-Taiwan High Speed Rail Project Started on the 23rd, http://finance.haiwainet.cn/n/2016/1223/c3542130-30594985.html

## D. Fiscal Impact

**111.** The fiscal impact of sea-rail multimodal transport on Liaoning Province not only affects fiscal revenue but also fiscal expenditure as well as the fiscal policy system.

### *1. Impact on Fiscal Revenue*

*a) Reduce Costs and Increase Efficiency and Financial Revenue*

**112.** Multimodal transport is an important means of integration of transport networks. It has the advantages of high efficiency, low cost, combined advantage and expanded space. The development of multimodal transport will not only help the transformation, upgrading and structural adjustment of the transport system, but will also be conducive to the consolidation of various transport resources and the facilitation of international trade. It will truly achieve regional interconnection. In order to meet the needs of economic globalization, the transport industries in various countries are actively seeking more efficient, safe and convenient modes of transport. At the beginning of the 20th century, the developed countries began to reform the single transport system, use containers to transport goods, and formulate uniform standards for containers that are suitable for various modes of transport such as railways, highways and water transport. With the release of international container standards from the International Organization for Standardization (ISO), [41]the developed countries in Europe and the United States took the lead in entering the container multimodal transport era. In the meantime, a more rational and efficient multimodal transport model has also drawn the attention of all countries.

**113.** The sea-rail multimodal transport operation is an important mode of multimodal transport. Its purpose is to reduce costs, increase efficiency, promote energy conservation and emission reduction and improve the transport system as a whole. The cost reduction and efficiency enhancement should be the core components. According to the survey conducted by China's Ministry of Transport, most of the cost of multi-modal transport is lower than that of direct on-highway transport, reducing the average cost by about 30%. However, the scale of multimodal transport in China only accounts for 2.9% of the total freight volume of the whole society, among which the proportion of container transport by sea and railway is 2.5%, while that in developed countries such as the United States is 40% and in France 35%. This led to the cost of transit in China accounted for about 30% of the entire logistics costs. Tan Xiaoping, Deputy

[41] Fang Ran: Research on Basic Concepts Related to Integrated Transportation System, Transportation Systems Engineering and Information, December 2011, Volume 11, Issue No. 6, pp. 13-14.

Director of the Integrated Transportation Department of the Planning and Research Institute of the Ministry of Transport of the PRC, said: "According to preliminary investigations conducted by the Ministry of Transport, enterprises generally consider expanding the multimodal transport business as the next “blue ocean” for reducing costs and increasing efficiency in the logistics industry. According to data from the Ministry of Transport, the freight rate per unit of railway, waterway and highway in China is about 1: 0.13: 2.6, the energy consumption ratio is about 1: 0.7: 5.2 and the carbon emission ratio is about 1: 1.3: 10.9. The transfer of more long-distance road freight to the railway and water transport by means of intermodal transport will have considerable economic and social benefits. [42] Evidently, the development of sea-rail multimodal transport will help enterprises reduce costs and increase efficiency, so as to increase tax revenue and fiscal revenue.

b) *Fiscal Policy Relieves Tax Burden on Operating Companies*

**114.** On December 28, 2016, 18 departments including the Ministry of Transport of the People's Republic of China co-issued the *Notice on Further Encouraging Multimodal Transport. Article 1*, paragraph 3 of the Notice called for strict regulation of the charging of enterprises. “Administrative fees of railway, highway, waterway, aviation, postal courier and other transportation areas, government funds and the implementation of government pricing, operating fees set or guided by government shall be fully included in the list of directories and strictly enforced”. Make sure the relevant departments to strictly enforce the port, railway charges policy, and implement the fee disclosure system, as well as regulate the operational service charges. Standardizing transport enterprises in the relevant taxes and fees essentially requires the government’s relevant taxes to be open, transparent and consistent. On the one hand, it can reduce the tax burden of sea-rail multimodal transport enterprises, reduce their operating costs, and increase taxes at the state or local level. On the other hand, standardizing unified charging standards can provide enterprises with a fair competitive environment that can encourage more enterprises to carry out multimodal transport and thus increase their revenue.

### *2. Impact on Fiscal Expenditure*

**115.** From the perspective of fiscal expenditure, the entire sea-rail multimodal transport is a systematic project, in which the infrastructure construction

[42] Multi-modal Transport Development in the Golden Age - Interpretation on Further Encouraging the Implementation of Intermodal Work Notice, People's Republic of China Ministry of Transport official website, http://www.mot.gov.cn/jiaotongyaowen/201701/ t20170111_2153156.html

includes the main corridor, the collection and distribution system, the node construction and transit stations; and the sea-rail multimodal transport also involves the government subsidies on the enterprise transportation routes. It also include the introduction of personnel to improve the level of services, personnel training, etc. as well as the fiscal expenditure on upgrading information platform. Therefore, sea-rail transport requires fiscal input.

**116.** First, fiscal support is required for the construction of sea-rail multimodal transport infrastructure. The infrastructure construction of sea-rail multimodal transport includes major channels of railways and waterways, a collection and distribution system, transit stations, etc. The construction of these infrastructures urgently needs fiscal support. First, the railway facilities in Liaoning Province are not perfect enough. There are many places in the hinterland where there are no railways or the railways cannot handle the container business. This seriously restricts the development of sea-rail multimodal transport. Therefore, the railway construction of facilities in Liaoning Province needs fiscal support. Second, the port's collection and distribution system needs fiscal support. At present, among the 70 important ports delineated by the Ministry of Transport of our country, the entry rate of railways is only 37%. The system of collecting, distributing and transporting seriously restricts the development of port transport. In 2017, the Ministry of Transport, the State Administration of Railways and the China Railway Corporation jointly issued the "Plan for the Construction, Distribution and Collection of Ports and Ships in the 13th Five-Year Plan", which clearly defined the need to increase financial support and support the construction of the collecting and distributing railways and highways. Subsequently, on February 10, 2017, the General Office of the Ministry of Transport released the "Notice on Supporting the Collecting and Distributing Railway Construction", clarifying the conditions, procedures and funds examination and management for applying for the subsidies for these railways. Third, the construction of the transfer station of sea-rail multimodal transport in Liaoning Province needs financial support. The construction of transit stations can improve the efficiency and service quality of sea-rail multimodal transport. One of the bottlenecks facing Liaoning Province is the shortage of resources in transit stations. At present, there are many problems such as the small transit area, old facilities, incomplete functions and high costs. This will require fiscal support for the construction of the transfer stations.

**117.** Secondly, IT applications require financial support. Today's era is the era of the Internet. The development of sea-rail multimodal transport is inseparable from information technology. The IT applications in sea-rail multimodal transport help to improve the transportation efficiency and help enterprises to expand their

market. More intelligent and complete IT applications are an inevitable trend. In 2015, the State Council issued the Guiding Opinions on Actively Promoting the Internet Plus Initiative, which put forward 11 specific tasks including efficient logistics of Internet Plus and Internet Plus convenient transportation. It proposes to work faster to build an information service platform that crosses regions and industries, and improve docking and efficiency of supply and demand of logistics information. Encouraging the use of big data, cloud computing in the field of logistics....." and so on. In 2016, the *"Notice on Further Encouraging Multimodal Transport"* issued jointly by 18 departments also stated explicitly that "the establishment of multimodal transport should be based on the existing information management system of national public transport logistics information platform and e-port public platform, providing one-stop service such as qualifications, certification and accreditation, inspection and quarantine, clearance inspection, tax collection, legal consultation, credit evaluation and policy dynamic, etc. And the government should actively guide enterprises to release the data of terminal station, capacity allocation and schedules". Of course, the sea-rail interlinked information technology requires fiscal support.

**118.** Finally, subsidies on transport routes of sea-rail multimodal transport enterprises need fiscal support. Since the establishment of multimodal transport, developed countries have been vigorously developing the system through various policies and measures. Especially after the 21st century, the developed countries took multimodal transport as the dominant strategy for optimizing transport system. At present, a multi-modal transport system has developed various models, with advanced facilities and equipment, sound standard system, smooth transport organization and strong policy guarantee. The project group studied the fiscal support policies of developed countries, including the 20-year New York-New Jersey PIND project with a value of one billion U.S. dollars; the sea-rail multimodal transport incubator project in Rotterdam harbor in Netherland; the Federal Public Service Transportation and Traffic Bill etc. These fiscal policies at these ports have achieved good results and increased the container throughput by sea-rail multimodal transport. Based on the experience of developed countries, we can find that the development of sea-rail multimodal transport requires not only vigorous development of infrastructure but also a clear strategic position at the national level and overall planning through policy and fiscal support.

### *3. Impact on Fiscal Policy System*

**119.** At present, China has not yet promulgated relevant policies specifically for sea-rail multimodal transport. Relevant policies on sea-railway multimodal transport are scattered in polices targeted at transportation, multimodal transport, etc. In

recent years, the state's incentive and fiscal policies on multimodal transport mainly include:

**120.** First, to tackle the problem of insufficient policy support, lack of a holistic and integrated planning and the vicious competition among local governments, the Ministry of Transport formulated the "13th Five-year Plan for Comprehensive Transport Services". In the plan, it is clear that multimodal transport will be the dominant strategy for the "13th Five-Year Plan" for logistics development, and the government will fully tap the great potential of multimodal transport in resource integration, cost reduction, energy conservation and emission reduction, and actively construct a national multimodal transport system. Among them, directly related to fiscal is the third point in the guarantee policy. It sets out "to study and establish policies to support the development of integrated transport services and actively coordinate relevant departments to promote the development of integrated transport services by using fiscal, financial, taxation and land policy measures, with a view to strengthening the fiscal protection of basic public services. The government should increase capital investment in transportation hubs, ... innovate the mode of cooperation between government and social capital and lead more social investment to participate in key projects of integrated transport services ... "

**121.** Second, in December 2016, eight ministries and commissions including the Ministry of Transport, the Ministry of Foreign Affairs, the National Development and Reform Commission, the Ministry of Public Security, the Ministry of Finance, the Ministry of Commerce, the General Administration of Customs and the General Administration of Quality Supervision jointly released the "Belt and Road Initiatives on Implementation" "Proposal to Accelerate the Facilitation of International Road Transport", which clarified that by 2020, an open and orderly, modern and efficient international road transport system should be established. Among them, it is mainly Article 22, which explicitly refers to the fiscal contents, which stipulates that the reform of the fiscal authority and the division of responsibilities should be implemented. We must implement the Guiding Opinions of the State Council on Promoting the Reform of Fiscal Power and Spending Responsibilities of Central and Local Governments, actively study the international road transport management and safeguard mechanism, speed up the development of the port and highway facilities, hubs, and the International Road Transport Management System.

**122.** Third, on December 28, 2016, 18 departments including the Ministry of Transport jointly released the "Notice on Further Encouraging Multi-modal Transport." The notice stressed that the transport of medium and long distance goods should be transferred in an orderly manner from the highways to transport modes such as railways and waterways. The railway freight market

reform should be pursued and the management of railway freight transport and the mode of operation and organization of railway transport should be innovated. The prices of certain competitive area of railway freight transport should be gradually liberalized. And the government should establish and improve the price formation mechanism of railway freight transportation that can reflect the market supply and demand, competition condition and the difference of service quality. This is the first time that a special deployment of multimodal transport is jointly promoted by the government at the national level and by various departments. It has pointed out a clear direction for the planning of the sea-rail multimodal transport of the in our province. Which involves the financial content is mainly Article (v), namely to improve the infrastructure network. The government requires the Ministry of Transport, the National Development and Reform Commission, Ministry of Land and Resources, Ministry of Housing and Urban-Rural Development, Ministry of Finance, People's Bank of China, General Administration of Customs, Railway Administration, Civil Aviation Authority, State Post Bureau, China Railway Corporation, AQSIQ to take advantage of the logistic channel, and expedite the formation of the main framework for national multimodal transport network that runs both inside and outside the country and optimize the layout of multi-modal transport nodes in a classified manner. These departments also should optimize the layout of inland dry ports and improve the service of port functions, and guide the reasonable layout of airports based on freight transport functions. They should also focus on the technical upgrading for the railway corridor facilities that have the demand for piggyback transport and double-deck containerized transport and technological economy advantages. The departments should also promote the joint development of intermodal hubs and related industries, and actively expanding supporting services such as market trading, warehouse storage and distribution, logistics and processing, and financial settlement, in the meantime, support the construction of multimodal transport hubs and distribution systems that have public good attributes, upgrade transportation equipment, and share information, etc.

**123.** Fourth, on February 3, 2017, the State Council promulgated the "Development Plan for the Modern Integrated Transport System for the Thirteenth Five-Year Plan", which plans to set up a large number of major projects in infrastructure, transportation services, intelligent transportation green development and security. The plan has also put forward key tasks including improving the network of facilities, strengthening strategic support, optimizing transportation services, promoting intelligent management and green development, strengthening security and new fields of business and deepening reforms. What directly relates to the financial content are mainly Article IX (c) "to speed up reform of investment and financing" and Article X (b) "to increase policy

support." Article 9 (3) requires: "To establish and improve the linkage mechanism between the central government and local governments and to optimize the arrangement of government investment. Based on the pilot demonstration, the government should introduce the government private partnership (PPP) model to the transportation sector. And participation in the construction, operation and maintenance of transportation projects is encouraged through ways of franchising, government procurement services, etc. With the controllable risks, the policy banks and development financial institutions should increase support for credit funds, expand direct financing. Insurance funds' participation in the construction of major transportation infrastructures though ways of bond and equity is encouraged. The government also should actively utilize the platforms of Asia Infrastructure Investment Bank and Silk Road Fund to promote the construction of interconnected transportation projects. "Article 10 (2) requires that" We will improve the policy support for transport facilities and transport services that concern public welfare and strengthen support for such package policies as land, investment and subsidies, effectively guarantee land for transport construction, and give certain policy preferences regarding land use planning and land supply. We will increase policy support for green intensive mode of transport such as waterway and railway transport. Efforts should be made to give full play to the enthusiasm of all parties and make full use of existing supportive policies such as the comprehensive land development by railways and the railway development fund so as to form institutional arrangements for the financial subsidies for public transportation of the railway as soon as possible. The debt structure of railway enterprises will also be improved. Construction funds will be given to key transport sectors to help alleviate poverty. The responsibility of local government will be planned as a whole. The central government and local governments will work together to promote comprehensive transport hub integration.

**124.** Fifthly, in 2017, the Ministry of Transport, the State Administration of Railways and the China Railway Corporation jointly issued the "Proposal for the Construction of a Shipping and Drainage System in the 13th Five-Year Plan", which clearly stipulated that more funds should be provided to support the development of the distribution railways and highways. Subsequently, on February 10, 2017, the General Office of the Ministry of Transport released the "Notice on Supporting the Work of Distribution Railway Construction", clarifying the conditions, procedures and funds examination and management for the subsidies for the construction of distribution railway.

**125.** It can be seen that the development of multimodal transport in China is in a strong policy cycle. However, there still exist deficiencies in China's supportive

policies for the railway and sea transport, especially the financial supportive policies. The current financial system of sea-rail multimodal transport faces the following challenges. First of all, there are relatively few related financial support policies. In the above-mentioned policy documents, the contents of the fiscal policy mainly target on two aspects. One is that it requires fiscal support for the transport infrastructure. And the other is to accelerate PPP model in the field of transportation. The current fiscal policies on sea-rail multimodal transport are less concerned about the companies and so on. Second, the existing few fiscal policies are too macroscopic. The existing fiscal policies are stipulated in the planning documents, encouraging documents and advocate documents. Most of the contents of these documents are macroscopic plans and incentives for transportation or multimodal transport. They are not specific operable. Financial support policy for sea-rail transport is too low. At present, China still lacks systematic laws and regulations on sea-rail multimodal transport and there is no nation-wide supportive measures and implementing rules. The only explicit fiscal support documents at the national level are also only for transport infrastructure, not for sea-rail multimodal transport. Some local governments have issued normative documents such as notices or opinions in the name of municipal governments, and the legislative level is too low.

**126.** Facing the new context of multimodal transport development under the "Belt and Road" strategy, at the policy level, the State Council has successively released a series of policy documents that propose to perfect the modern integrated transport system and develop multimodal transport and cross-border multimodal transport routes. In 2016, multi-modal transport development policy was launched intensively. Our policy support for multimodal transport is constantly upgrading. In 2017, it is the first time that the multimodal transport development plan be released at the national level. However, prior to the top fiscal support plan was introduced, the development of the local sea-rail multimodal transport was organized by various departments on their own. However, due to local governments' lack of a top-level design for the development and planning of sea-rail multimodal transport, the development of the domestic market pattern is fragmented. Even repeated subsidy policies across the country have resulted in vicious competition in the industry. Therefore, we think that the development of sea-rail multimodal transport in Liaoning Province urgently needs a unified top-level development plan. The country's top-level planning is yet to be launched. It is also necessary to specify relevant local laws and regulations or administrative rules with Liaoning Provincial People's Congress or the Liaoning Provincial Government as the main body, and specify the specific fiscal support measures for the rail-sea

multimodal transport across the province. This is the demand for the existing fiscal system of Liaoning Province.

### E. Index Table of Policies Listed in IV

| No. | Name | Release time | Release agency |
|---|---|---|---|
| 1 | 《*Implementation Plan for Liaoning Province's Participation in " One Belt, One Road " Initiative* | 2016 | People's Government of Liaoning |
| 2 | *The 13th Five-Year Plan for the " One Belt, One Road " Initiative in Liaoning Province* | 2016 | People's Government of Liaoning |
| 3 | *The Opinions of the Central Committee of CPC and the State Council on the Implementation of Revitalization Strategy of the Old Industrial Bases in Northeast China* | 2003 | The State Council |
| 4 | *The Decision of Liaoning Provincial Party Committee and Provincial Government on Speeding up the Building of Dalian Northeast Asia International Shipping Center* | 2004 | People's Government of Liaoning |
| 5 | *The Opinions of Liaoning Provincial People's Government on Accelerating the Development of Coastal Ports* | 2004 | People's Government of Liaoning |
| 6 | *The Development Plan of Dalian Northeast Asia International Shipping Center* | 2004 | People's Government of Liaoning |
| 7 | *The Opinions of Dalian Municipal People's Government on Accelerating the Building of Dalian Northeast Asia International Shipping Center* | 2004 | People's Government of Dalian |
| 8 | *The Opinions of Dalian Municipal People's Government on Implementing the Development Plan of Dalian Northeast Asia International Shipping Center* | 2004 | People's Government of Dalian |
| 9 | *Dalian Northeast Asia International Shipping Center Development Plan* | 2007 | People's Government of Liaoning |
| 10 | *The Master Plan of Dalian port* | 2007 | People's Government of Liaoning |
| 11 | *The Opinions of the State Council on Major Policy Measures for Supporting the Revival of Northeast China in the Near Future* | 2014 | The State Council |
| 12 | *Overall Plan for the China (Liaoning) Pilot Free Trade Zone* | 2017 | The State Council |

| | | | |
|---|---|---|---|
| 13 | *Guiding Opinions on Promoting the Development of Information-Based and Intelligent Transport* | 2013 | The Ministry of Transport |
| 14 | *Form of Transport Informatizaiton Standard System* | 2013 | The Ministry of Transport |
| 15 | *Guiding Opinions on Actions Actively Promoting Internet Plus* | 2015 | The State Council |
| 16 | *Guiding Opinions on Taking the Lead of Economic and Social Development under the " Four-Pronged Comprehensive Strategy "* | 2015 | The Ministry of Transport |
| 17 | *Implementation Opinions on Promoting the Openness and Sharing of Data Resources in the Transport Industry* | 2016 | The Ministry of Transport |
| 18 | the *Guiding Opinions on Promoting the Network Security in the Transport Industry* | 2016 | The Ministry of Transport |
| 19 | *The 13th Five-Year Plan for Transport Informatization* | 2016 | The Ministry of Transport |
| 20 | *Action Plan to Actively Promote Internet Plus in Liaoning Province* | 2015 | People's Government of Liaoning |
| 21 | *Opinions of the General Office of the State Council on In-depth Implementation of the 'Internet Plus Circulation' Action Plan* | 2016 | The State Council |
| 22 | *Action Plan to Implement Internet Plus* | 2016 | People's Government of Liaoning |
| 23 | *Several Opinions of the State Council on Encouraging and Guiding the Healthy Development of Private Investment* | 2010 | The State Council |
| 24 | Comprehensive Transport Services' *Thirteen Five Year Plan* | 2016 | The Ministry of Transport |
| 25 | *Opinions on Implementing the "Belt and Road Initiative" and Accelerating the Facilitation of International Road Transport* | 2016 | The Ministry of Transport and 7 other ministries |
| 26 | *Joint Notice of on Further Encouraging the Development of Multimodal Transport* | 2016 | 18 Departments including Ministry of Transport |
| 27 | *Development Plan on a Modern and Integrated Transport System under the 13th Fifth Year Plan* | 2017 | The State Council |
| 28 | *Development Plan of Collection and Distribution System of the Seaports under the 13th Fifth Year Plan* | 2017 | The Ministry of Transport, National Railway Administration, and China Railway |

| | | | |
|---|---|---|---|
| 29 | *Notices on Building a Supporting Collection and Distribution System for Railways* | 2017 | The Ministry of Transport |

## V. Bottlenecks and Challenges

**127**.In the *Medium and Long-Term Plan for the Development of the Logistics Industry (2014-2020)* (No. 42 [2014], State Council) issued by the State Council, the first high-priority project to develop is multimodal transport, among which sea-rail transport is the most efficient logistics mode. Especially under the national "One Belt and One Road" strategy, the demand for international maritime logistics is even greater. Despite the outstanding advantages of sea-rail multimodal transport, China's still lags behind. Through analysis, the study team believes that there are numerous bottlenecks and difficulties in the current development of sea-rail multimodal transport in Liaoning Province.

### A. Insufficient Freight Supply

**128.** The freight volume of sea-rail multimodal transport port depends on the economic development of the hinterland. The hinterland of Liaoning's sea-rail transport is mainly the northeast. In recent years, with the support of various national preferential policies, although the economy in northeast China has been somewhat more developed, it still lags behind other economically developed regions. Compared with other domestic ports, the proportion of foreign trade export is very low. [43]

**129.** In recent years, the US financial crisis has impacted the global industry chain. As a result, the overall international economic environment does not look very promising and the foreign trade volume has not seen much increase. From 2014 onwards, the total volume of import and export has been decreasing for two consecutive years. The total volume of import and export in 2016 was USD 86.521 billion, which is not much higher than that in 2010 (see Table 5). Consequently, the growth rate of foreign trade freight has been decreasing. Therefore, due to the low level of developed economy in the hinterland and the insufficient supply of foreign trade, the export volume of foreign trade is not high, and the cross-sea seaplane transport in Liaoning Province faces the problem of insufficient freight volume.

[43] Tong Xinliang: Study on the Development Strategy of Dalian Port Container Sea-Rail Multimodal Transport, Dalian Maritime University Master's Thesis, 2014.

**Table 5 Total Import and Export of Liaoning 2009-2016**

| Indicator (USD 100 million) | Year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| **Total volume of import and export** | 629.2 | 806.7 | 959.6 | 1039.9 | 1142.8 | 1139.6 | 960.8 | 865.21 |
| **Total export volume** | 334.4 | 431.2 | 510.4 | 579.5 | 645.4 | 587.6 | 508.4 | 430.65 |
| **Total import volume** | 294.8 | 375.5 | 449.2 | 460.4 | 497.4 | 552.0 | 452.4 | 434.56 |

**130.** In addition, China has long coastline. The ports are relatively densely distributed, which means that some ports share the same hinterland and they have overlapping hinterland resources. Take the Port of Dalian in Liaoning Province as an example. In the course of developing into an international large port, Dalian Port has been facing with the severe challenges of foreign ports and domestic ports that were squeezing its resources. The challenges of foreign ports mainly include Busan Port in South Korea, Kobe and Tokyo Port in Japan. The competition in domestic ports mainly includes Qingdao Port, Tianjin Port and Yingkou Port. Lack of freight is a factor restricting the development of sea-rail multimodal transport in Liaoning Province

### B. Higher Freight Rate

**131.** Theoretically, the cost of container transport by train = the cost of container transport by highway × 50%. However, in reality, the freight rate adjustment system for rail transport is not as flexible as highway or water transport; Highway transport mostly involves private and individual vehicles attached to transport companies with flexible prices; the self-employed in highway transport business mostly make verbal negotiations, and the final price is agreed upon by both parties; the rate of empty car move on the way back is relatively low, and consignment on the return trip compensates the costs. Railway carries out uniform tariffs regardless of time and place. However, the competitive environment of the market varies in different regions and at different times. The unified tariffs cannot cater to demands in such a highly competitive market and also prevent railway transport enterprises from true autonomy and independent

decision-making. [44]As stipulated in the 2015 *Notice of NDRC on Adjusting the Price of Railway Freight Transport and Further Perfecting the Mechanism of Price Formation*, only railways owned by the China Railway Corporation (CRC) which adopts special tariff and joint railways controlled by CRC are allowed to lift the price ceiling by no more than 10% and keep the same price floor, with the transport tariff promulgated by the state as the benchmark price.

**132.** At the same time, the empty container rate is high retuning from inland to ports, and the turnaround time is long, which further increases the cost of container shipping. Therefore, sea-rail multimodal transport in Liaoning province lacks the advantage of low cost. For example, the density of container trains traveling from the port to major inland container logistics center is about two shifts per week on average. Generally, it takes three days for containers with scattered and small quantities of cargo to assemble in the port through train transport, and another three days for the return trip, emptying, goods delivery, and return to the port. It takes one day through highway transport to reach the port, saving four to five days in contrast to sea-rail multimodal transport. [45]Therefore, Liaoning sea-rail multimodal transport has no competitive advantage in transport cost.

### C. Infrastructure Issues

**133.** First, the railway facilities need to be furthered improved. Still many places inland are out of the coverage of railway. Even if some places have been accessed to the railways, however, they still cannot do container trade. This problem troubles customers, cause after they transfer containers to the carriers but who cannot give the exact arrive time, thus leaving customers unable to arrange or shift work as well as arrange production and consumption. Of course, Liaoning Province has been actively trying to strengthen the railway construction. [46]The 13th Five-year Plan for Transportation Construction of Liaoning Province expects that by 2020, 1000 km railway will be built, of which 711 km is high-speed rail passenger line; the whole province's national railway business mileage will reach 6496 km, of which2248 km is high-speed passenger line. The length of new dual-line railways will be 1,050km, the new electrified mileage 2,500km, the dual-line railway 4,400km and the electrified railways 5,600 km. The railway density will reach 4.8 km / 100 square

[44] Zhu Weidong: Discussion on the Establishment of Market Price Mechanism by Railway Transport Enterprises, Railway Freight, 2017, No.4.

[45] Zhai Junyuan: Study on China's Northeast Container Sea-railway Multimodal Transport Development strategy, Railway freight, Issue No. 5 of 2012.

[46] Xia Weipeng: Consideration and Exploration on Promoting Sea-Rail Multimodal Transport, Containers, No. 11, 2003.

kilometers, with an increase of 0.8 km / 100 square km ". We will intensify the construction of railway corridors, accelerate the expansion of the channel limits, and open up key nodes of railway connectivity. Optimizing the transportation structure of road network and promoting the construction of rapid railway construction is one of the key tasks of transportation construction during the 13th Five-Year Plan Period.

**134.** Second, the ports' collecting and distributing system is not sound enough. At present, of the 70 important port areas designated by the Chinese Ministry of Transport, the total rate of railway entry is only 37%. We can see that the collecting and distribution system has seriously restricted the development of our port transportation. In ports of Liaoning Province, the same problems remain and the port railway has not yet become an important part to the whole railway transportation network. For the time being, in Liaoning Province, even some port railways have been accessed to the wharf, but the loading and unloading line is to short too giving full play of the advantages brought by the railways. [47]Meanwhile, some ports cannot transfer containers directly from the sea to the railways within their port area, but depends on the highway to complete transportation between the terminal yard and railways, which not only increase the sea-rail transport costs, but reduce the efficient. In addition, some ports still do not have access to the railway, resulting in the barrier of port and rail connection, with additional operational costs.

**135.** Thirdly, lack of transfer stations. The transfer stations can provide services such as loading and unloading, warehousing, door to door services, collection of cargos for bulk shipment, container shipment and repairmen to enhance efficiency and quality. It is one of the constraints to hinder the development of Dalian port. Cities that currently have a transfer station are Shenyang, Changchun, Jilin and Mulin etc., which are facing problems such as small coverage, old facilities, incomprehensive functions, low efficiencies and high cost.

### D. Institutional Problems: Insufficient Sea-Rail Coordination System

**136.** There is lack of a special organization for comprehensive sea-rail multimodal transport organization and administration. The powers and responsibilities of various departments lack coordination. They act in their own way and only fulfill their respective roles and do not coordinate with each other. Although the super-

[47] Yin Yibai, Zhou Lijuan, Development Issues and Solutions Facing China's Container Sea - Rail Multimodal Transport, Navigation

ministry reform in 2018 in China has moved the Ministry of Railways and the Civil Aviation Administration of China under the administration of the Ministry of Transport, there still lacks an agency responsible for unified administration of multimodal transport within the Ministry of Transport. For example, the Transportation Department of Liaoning Provincial has the following responsibilities: promote the construction of an integrated provincial transport system, coordinate the development of highways and waterways and the construction of railways and civil aviation in the province, establish a sound institutional mechanism in compatible with the provincial integrated traffic transport system, modify main transport routes and key hub nodes layout across the province, and facilitate the integration of various means of transport; supervise provincial highway and waterway construction, manage the construction and maintenance of provincial transport infrastructure such as highways and waterways, manage the planning, utilization and supervision of the ports, port-appropriate shorelines, channels and associated auxiliary facilities; manage local railway industries in the province. China Railway Shenyang Group is responsible for railway transport. Its business covers three sub-provincial cities including Shenyang, Dalian and Changchun; Benxi, Anshan, Jilin and Fushun (the fourth “relatively large city” recognized by the State Council); coastal cities including Dalian, Jinzhou, Yingkou, Dandong, Panjin, Huludao and Shanhaiguan District of Qinhuangdao. Shenyang Railway Administration is responsible for supervision and management of railway transport safety, railway engineering quality and safety, and railway administrative law enforcement, etc., and relevant railway supervision and management for China Railway Harbin Group Co., Ltd., and China Railway Shenyang Group Co., Ltd. It is thus clear that it is very difficult to coordinate, as railways, highways, and waterways in Liaoning are administrated under different administrative agencies, which belong to different administrative areas.

### E. Incomprehensive Network

**137.** The international logistics information platform based on maritime transport and the railway TMIS （Transportation Management Information System- information platform have their own working mechanism and lack information sharing. In addition, the interface connecting these platforms is not standardized, which makes it difficult to achieve the core values of sea-rail multimodal transport such as “one-step declaration, inspection, and clearance.” For example, various departments such as railway, port, multimodal system management units, transit stations, shipping companies, shipping agencies, shippers, and regulators have each established an independent information management, without a unified information exchange platform for the same businesses across the systems. Unshared information created inefficiency due to repeated intake of data by ports

and railways and makes it impossible to provide container businessmen with one-stop streamlined service (one commission, one window, one bill, and full convenience). Besides, since information are not shared among ports and foreign railways, large volumes of data are entered repeatedly by ports and railways, which leads to inefficient information transfer and a poor connectivity between ports and railways. Software development is the key in sea-rail multimodal development. Although the (Dalian port) national demonstration project of the application of the Internet of things in container sea-rail multimodal transport has successfully passed the inspection of the expert group of the Ministry of Transport, various functions of sea-rail multimodal transport in Liaoning province are yet to be strengthened.

### F. Index Table of Policies Listed in VI

| No. | Name | Release time | Release agency |
|---|---|---|---|
| 1 | *Medium and Long-Term Plan for the Development of the Logistics Industry (2014-2020)* | 2014 | The State Council |
| 2 | *Notice of the National Development and Reform Commission on Adjusting the Railway Freight Rate and Further Improving the Pricing Mechanism* | 2015 | National Development and Reform Commission |
| 3 | *Terminology of Multimodal Transport of Goods* | 2017 | The Ministry of Transport |
| 4 | *Multimodal Transport Unit Identifier* | 2017 | The Ministry of Transport |
| 5 | *Maritime Law of the People's Republic of China* | 1992 | National People's Congress |
| 6 | *Contract Law of the People's Republic of China* | 1999 | National People's Congress |

## VI. Development Proposals

**138.** The study team makes the following recommendations on the development of sea-rail multimodal transport in Liaoning province:

### A. Development of both bulk cargo and container sea-rail multimodal transport

#### 1. *Legislation Guarantee for Sea-Rail Transport*

**139.** The research team studied the foreign representative ports' fiscal support policy on sea-rail multimodal transportation, including a 20-year-long research on the New York-New Jersey port, the PIND plan which cost $1 billion; the railway incubator project of Rotterdam in the Netherlands; the Federal Public Service Transportation Act of Antwerp, Belgium, etc. These ports have achieved good results in their financial support on the sea-rail transportation, and increased the container throughput. The study found that all financial support policies of these ports were based on the top-level design of their own countries. For example, the PIND plan of the New York-New Jersey port was supported by the United States' land-use transport efficiency act, which was enacted in 1991 to encourage the development of multimodal transport. The Rotterdam railway incubator project of the sea-rail transportation is based on the European Union's Pan-European Transport Network.; and the support policy in Antwerp, Belgium, is based on the Federal Public Service Communication and Transportation Act, which was enacted by the Belgian government in 2009. Through the experience of the current sea transportation development in developed countries, we can find that the development of the sea-rail transportation not only rely on the infrastructure construction, but also need to clarify its strategic position from the national level, through policy and financial support to carry on the overall planning.

#### 2. Strengthen Continuity and Stability of the Fiscal Policy

**140.** The sea-rail transportation is a kind of infrastructure facility featuring certain public goods characteristics--large investment and long recovery period. As a result, countries with developed sea-rail transportations mostly adopt long-term and sustainable policy support measures. For example, the New York - New Jersey port's fiscal support policy - PIND has been planned for 20 years; The Belgian government has formulated the Federal Public Service Communication and Transportation Policy, and through legislation to guarantee the continuity and stability of the subsidy policy. Comparatively speaking, most support policies of China on the sea-rail transportation are based on the normative documents formulated by the municipal government with lower legislative level,

causing all these policies short in timeliness. In 2010, for example, the Tianjin Municipal government put forward the Financial Support for Accelerating Tianjin Binhai New Area on the Construction of the Northern International Shipping Center, in which subsidies for the sea-rail transportation only lasted for one year; In 2013, Dalian Municipal government promulgated the Implementation Rules for Subsidies on the Development of Containers in Dalian Port from 2014 to 2015, which stipulated that the implementation period of the subsidy on the sea-rail transportation was 2 years. In 2015, the People's Government of Ningbo city issued the Notice on Further Accelerating the Implementation of the Policy on Supporting the Sea-Rail Transportation in Ningbo City, stipulated that the implementation period of the subsidy was 3 years, because shorter fiscal support policies lack of stability and continuity, do bad to the healthy and sustainable development of the sea-rail transportation, such as in 2015, the volume of Dalian port's sea-rail transportation ranked first in the country, of which cross-border container service volume climbed nearly half when compared with last year. It cannot be denied that this has nothing to do with the financial support policies implemented by Dalian port, but in sharp contrast, the amount of cross-border container traffic in the Tianjin port, which stopped subsidies, fell 35 per cent in the same period. Therefore, in view of the short timeliness of the existing fiscal support policies in Liaoning Province, the research group suggested that Liaoning should through legislation to guarantee the continuity and stability of fiscal support policies.

### *3. Strengthen the Systematic Support of Fiscal Policy*

**141.** The sea-rail transportation is a complex and integrated project, involving many subjects and institutions. For such a complex form of multimodal transport, we believe that the policy should be systematically encouraged. The research team studied the PIND plan of the New York - New Jersey port authority. PIND plans to solve a series of problems such as road congestion and environmental pollution caused by road transportation. In addition to the subsidy policy from the port authority, the federal government also gives strong support to the project construction, provides not only part of the inland depot construction funds, but also through subsidies like "easing congestion fees" and "air quality fees" to support the project construction. Its main characteristics are systematic, comprehensive and long-term. In China, the existing municipal government's support policy for the sea-rail transportation is mostly designed for the short-term improvement, thus lacks system. [48]In 2015, for example, the

[48] Tang Ning, Yang Jinglei: Comparative Study on Support Policies of Sea-Rail Multimodal Transport at Home and Abroad, Port Economics, 2016, No. 21-24.

Notice on Further Accelerating the Implementation of the Policy on Supporting the Sea-Rail Transportation in Ningbo City stipulated to subsidy the actual operator of sea-rail transportation; To provide funding for the "five fixed" lines; To provide subsidies to container transport companies which provide container transport services between railway terminals and wharfs; To subsidize shipping companies that provide container service for container sea-rail transportation; To provide support for the construction of the Internet of Things on sea-rail transportation. Published by the Dalian Municipal Government in 2013, the Implementation Rules for Subsidies on the Development of Containers in Dalian Port from 2014 to 2015 stipulated that for container operating companies or logistics enterprises which do business between inland ports and Dalian ports, and with annual capacity no less than 5000 can enjoy subsidies; To provide highway tolls subsidy for container trailer enterprises providing service to Dalian port; To provide container terminal construction subsidy to port enterprises who invested in Dalian to construct special container terminal, etc. Obviously, the purpose of these financial support policies is to promote the rapid increase of the sea-rail transportation in the short term and lacks unison. Therefore, the research group suggested that Liaoning should construct a long-term systematic financial support plan by reference to the New York - New Jersey port. At the same time, the research group also suggested that the practice of Antwerp port should be taken into consideration, taking into account the three elements, namely transport distance, weight and destination, and formulating a mixed support policy for monetary subsidy and tax exemption.

### B. Encourage and Guide the Participation of More Private Capital

**142.** The private capital of Liaoning province will be one of the main financing ways for future sea-rail transportation. To encourage the enthusiasm of private capital investment in the sea-rail transportation, Liaoning provincial government should perfect the corresponding policies as well as laws and regulations system as soon as possible, for private capital to create a good investment environment, to protect the interests of investors, improve the service system of non-governmental investment, and implement various supporting policies.

#### *1. Improve the private investment environment*

**143.** First, strengthen institutional mechanism and improve policies and regulations related to improving the environment for private investment. In 2016 the State Council issued Several Opinions on Encouraging and Guiding the Healthy Development of Private Investment, which proclaimed to encourage private

capital to join in the construction of highway, water transport, port terminals, general aviation, civil airport, facilities and so on. Promptly formulate railway reform, carry out the introduction of market competition, promote the diversification of investment, encourage private capital to participate in railway, railway branch lines, railway ferry and yard facilities construction...We will explore the establishment of a railway industry investment fund, actively support railway enterprises to speed up the listing of shares, and expand channels and ways for private capital to enter the railway construction sector. However, the view of this document is relatively broad, and we need to formulate relatively specific implementation policies. It is suggested that Liaoning Province Transport Department must strengthen cooperation with other government departments in the policy support, supervision system, financing mechanism, and franchising system construction, changing the current transportation and other public facilities which use private capital mainly based on the principle of encouraging the status quo of administrative documents, in the form of local laws or administrative regulations to guarantee operability and effectiveness of various kinds of works. Second, optimize the civil investment administrative examination and approval systems; improve administrative behavior and administrative efficiency. Government should limit the motion of the administrative power, coordinate relevant departments to deepen the reform of the administrative examination and approval system, to promote investment facilitation, make clear the administrative examination and approval matters involving private investment further, within the scope of the policy to simplify examination and approval procedures, improve the administrative efficiency.[49]

### *2. Implement Supporting Policies*

**144.** First, establishing the mechanism of fiscal interest discount. There are three main ways to carry out the fiscal discount: to apply for the special interest rate to cultivate the emerging industries and the advantageous industries; to entrust loans to the infrastructure to carry on the discount. Second, improving land use policy. Attracting private capital by granting land compensation. If the land resources of the transportation hub are allowed to be commercialized, the land for the construction of the transportation industry park will be sold at a low price, etc. Third, establishing a tax compensation system. Such as preferential tax rate for enterprises that are eligible to invest in new industries. Fourth, we will establish and improve the exit mechanism for private investment.

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[49] Tang Ren, Sun Huaqiang: Transportation Sector to Introduce Private Capital into the Field and the Main Ways to explore, Transportation Accounting and Financials, Issue.No.8, 2012.

Encouraging and supporting private capital to join into the transportation sector, while developing practical and feasible exit mechanism for private capital, especially for those private capitals in transportation infrastructure construction, such as credit recovery, share repurchases.[50]

### C. **Development of Both Bulk Cargo and Container Sea-rail Multimodal Transport**

**145.** According to the economic and industrial structure and demand of import and export trade in Liaoning province, it is suggested to develop bulk cargo and container sea-rail multimodal transport together. According to the speed and level of economic development in Liaoning Province, it is suggested that the rail and sea transport should be gradually developed.

#### *1. Development of both bulk cargo and container sea-rail multimodal transport*

**146.** The study team put together the annual gross domestic product of Liaoning province in the past eight years. It can be seen from Table 6 that from 2009 to 2014, the economy in Liaoning province saw rapid growth with a steady GDP growth. However, from 2014 to 2015, the economic development slowed down with only RMB 4.3 billion increases in GDP. In 2016, Liaoning's GDP was RMB 2203.79 billion, ranked the 14th in the country but with a growth rate of -2.5%, making it the only province with a negative growth rate in China.

**Table 6 Annual GDP of Liaoning Province**

| Economic sectors | Total GDP (RMB 100 million) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| GDP | 15212.5 | 18457.3 | 22226.7 | 24846.4 | 27213.2 | 28626.6 | 28669.0 | 22037.9 |
| Primary industry | 1414.9 | 1631.1 | 1915.6 | 2155.8 | 2216.2 | 2285.8 | 2384.0 | 2173.0 |
| Secondary industry | 7906.3 | 9976.8 | 12152.2 | 13230.5 | 13963.9 | 14384.6 | 13042.0 | 8504.8 |
| Tertiary industry | 5891.3 | 6849.4 | 8159.0 | 9460.1 | 11033.1 | 11956.2 | 13243.0 | 11360.0 |

[50] Tang Ren, Sun Huaqiang: Transportation Sector to Introduce Private Capital into the Field and the Main Ways to explore, Transportation Accounting and Financials, Issue.No.8, 2012.

**147.** The study team has summarized the output of major agricultural and industrial products in Liaoning province for the past eight years (see Table 7). The team found that from 2009 to the present, the major agricultural products with the highest yield in Liaoning are all grains, with an output of 15 million tons, followed by fruits, aquatic products and meat products, each with an output of about 5 million tons. As a traditional industrial base, Liaoning Province has a large output of industrial products. Over the past eight years, the production of finished steel products was the highest, which topped at 63.376 million tons in 2015. Steel output was ranked in the second place, with an output of over 47 million tons for the past eight years, and reached 58.949 million tons in 2015. This is followed by the cement output, which was higher than 47 million tons for the past eight years, and even reached more than 60 million tons in 2013. The output of crude oil was ranked the fourth place with an output of 10 million tons for the past 8 years. It can be hence concluded that, as an important economic hinterland of Liaoning's sea-rail multimodal transportation network, Liaoning Province has a huge output of finished steel, steel, crude oil, grain, etc.

**148.** The study team also studied issues such as natural resources, industrial structure, and the reform of enterprise ownership in Liaoning province. The province has a total land area of 145,900 $km^2$, of which 41,600 $km^2$ is arable land, 5,981 $km^2$ is fruit and vegetable gardens, 56,200 $km^2$ is forestland, 3,850 $km^2$ is grazing grassland, and 10,800 $km^2$ land used for cities, towns, villages, industries, and mines. With 5.674 million hectares of land designated to develop forestry, Liaoning province has extremely rich forest wildlife resources. Liaoning province is also rich in mineral resources. A wide range of minerals scatter across the province. However, mining features long history, large scale, high intensity, and high degree of depletion. Over 70 types of minerals have already been discovered in 692 sites with a potential value of RMB 1.6 trillion. The abundant land resources and mineral resources in Liaoning provide superior conditions for the development of primary and secondary industry.

Table 7Liaoning's Main Agricultural and Industrial Product Output

| Indicator | Unit | Total output | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| **Output of major agricultural products** | | | | | | | | |
| **Grain** | | 1591.0 | 1765.4 | 2035.5 | 2070.5 | 2195.6 | 1753.9 | 2002.5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 10,000 tons | | | | | | | |
| Fruits | 10,000 tons | 477.2 | 521.6 | 574.4 | 632.9 | 661.4 | 592.1 | 601.5 |
| Meat | 10,000 tons | 389.2 | 406.7 | 408.2 | 418.7 | 420.3 | 429.2 | 429.4 |
| Aquatic products | 10,000 tons | 534.7 | 429.1 | 453.9 | 480.8 | 504.9 | 515.7 | 523.7 |
| Output of major industrial products | | | | | | | | |
| Cloth | 100 million meters | 5.0 | 7.2 | 7.2 | 4.6 | 4.1 | 6.8 | 3.5 |
| Machine-made paper and paperboard | 10,000 tons | 77.2 | 88.5 | 76.2 | 73.3 | 48.8 | 41.2 | 36.0 |
| Household refrigerator | 10,000 pieces | 96.2 | 87.8 | 102.2 | 101.5 | 84.8 | 157.0 | 147.1 |
| Color TV | 10,000 pieces | 441.4 | 576.9 | 557.5 | 500.4 | 440.6 | 338.2 | 287.9 |
| Crude oil | 10,000 tons | 1000.0 | 950.0 | 1000.0 | 1000.0 | 1001.0 | 1021.9 | 1037.1 |
| Steel | 10,000 tons | 4783.2 | 5202.7 | 5424.8 | 5178.4 | 6356.5 | 6507.8 | 5894.1 |
| Finished steel products | 10,000 tons | 4943.4 | 5669.4 | 5761.1 | 5924.2 | 6863.0 | 6962.2 | 6337.6 |
| Cement | 10,000 tons | 4704.8 | 4785.8 | 5791.1 | 5809.0 | 6066.3 | 5875.6 | 4751.6 |

Data source: Liaoning Provincial Yearbook 2016

**149.** Liaoning has a large proportion of state-owned economy. In recent years, Liaoning province has been promoting reorganization among local SOEs, and between central SOEs and investors based on industrial chains and value chains. Some key enterprises have been strengthened through such reorganization, such as Dalian Shipyard and Dalian New Ship merged with Dalian to form Dalian Shipbuilding Industry Group Co. , Ltd. Shenyang Blower Factory, Shenyang Gas Compressor Factory, Shenyang Pump Factory reorganized to become the new Shenyang Drum Group and so on. Liaoning Province is also actively promoting mixed ownership reform. In August 2016, Liaoning transferred 20% equity of 7 enterprises including the provincial exchange group, provincial water resource group, Liaoning Energy Group, Liao Fishery Group, Fuling Mining Group, Shenyang Coal Group and Tiefa Energy Group to comprehensively promote the mixed ownership reform. Through restructuring and reorganizing, a large number of state-owned enterprises have

been transformed from big ones to strong ones and the economy of Liaoning Province has been promoted.

**150.** The study team also did research on the countries and regions with which Liaoning Province had import and export trade and the total volume (see Table 14) in 2016. For the past three decades, Liaoning's foreign trade partner countries and regions have been relatively concentrated and stable. Taking 2016 as an example. In 2016, the foreign trade in Liaoning Province totaled 571.253 billion yuan, of which exports totaled 208.478 billion yuan and imports amounted to 2,871.75 billion yuan. The region's top five importers and exporters in 2016 were the European Union, Japan, ASEAN (10 countries), South Korea and the United States, each with an amount of 96,030.4 million yuan, 84,050.62 million yuan, 68,727.3 million yuan, 52,891.79 million yuan and 51,993,64 million yuan respectively. In terms of exports, the top five countries are ASEAN (10 countries), the EU, Japan, the United States and South Korea, each with an amount of 54.39651 billion yuan, 51.60089 billion yuan, 37.80171 billion yuan, 31.05014 billion yuan and 26.62087 billion yuan respectively. In terms of imports, the top five countries are the EU, Japan, South Korea, the United States, Australia and the Russian, each with an amount of 58.22833 billion yuan, 32.44973 billion yuan, 26.27092 billion yuan, 20.943.5 billion yuan, 198.1954 billion yuan and 16.65641 billion yuan respectively. Except for the case of Chinese Taipei, Liaoning Province's exports to other parts of the world dropped in 2016, with a total decrease of 9.625% in total exports, while the total imports increased by 2.3006%, among which Saudi Arabia, Australia, Russia and Japan were the major contributors to such growth.

**151.** During the "12$^{th}$ Five-Year Plan" period (2011-2015), the trade-to-GDP ratio of Liaoning province was 17% lower than the national average; the export was characterized by small volume and irrational structure; the scale of equipment manufacturing "going global" was small, which means it did not drive enough export; foreign investment structure was yet to be optimized and the business environment was still undesirable. In 2015, the total import and export volume of Liaoning province was USD 96.08 billion, 1.2 times that in 2010. The total export volume in 2015 was USD 50.84 billion, 1.4 times that in 2010, and the total import volume was USD 45.24 billion in 2015, 1.2 times that in 2010.The export trade of Liaoning province in 2015 was ranked the 9$^{th}$ nationally; the provincial trade-to-ratio of 22%, ranked the 11$^{th}$ nationally. However, in 2016, Liaoning province saw a total volume of import and export of RMB 571.253 billion, 3.999% down from the same period of time in the previous year.

**152.** It can be hence concluded that Liaoning Province's major trade partners are Japan, South Korea, the United States, the European Union, ASEAN (10

countries), etc.; Liaoning has registered a relatively balanced trade in imports and exports; and also, the imports and exports in Liaoning Province have not been growing all the time.

**153.** The study team had also conducted a survey on the main imported and exported commodities of Liaoning Province (see Table 15 and Table 16). Since 2009, Liaoning Province, the main imported goods are iron ore and concentrate, crude oil, coal and so on. Among them, the imports of iron ore and its concentrates were 30 million tons annually; imports of crude oil were 15 to 25 million tons annually; while the coal imports were on the rise, as the imports were 6.15 million tons in 2009 and 14.244 million tons in 2015. Other main imported goods include synthetic filament yarn woven fabrics, cotton fabrics, motors and generators. Liaoning's main exported commodities are industrial products, such as steel, refined oil, crude oil and so on. Among them, the export of steel products continued to rise from 2.915 million tons in 2009 to 13.201 million tons in 2015; the export of refined oil products remained stable at 5 million tons and reached 5.992 million tons in 2015; the export of crude oil was 289,000 tons in 2015, which remained still from 2010 to 2014 but increased dramatically in 2015, reaching 2,222,000 tons. Other major exports include bearings, aquatic and sea products, paraffin, talc, motors and generators, transformers, metal processing machines and so on.

**154.** As the revitalization of the old industrial base goes on in Liaoning, Liaoning's import and export trade will have the following trends in the future: first, the bulk goods import and export volume will continue to increase. In particular, as the new capacity in heavy industry such as Anshan Iron and Steel Group and Benxi Iron and Steel Group is gradually put into production, iron and steel enterprises in Liaoning province will see increasing import demand for high-quality ores with low impurities. From 2009, the import of iron ore and iron ore concentrates has been exceeding 25 million tons consecutively in Liaoning province. The import was 25.275 million tons in 2015. Though it was lower than the 31.368 million tons in 2014, the absolute number was still on the top in the list of imported goods in Liaoning province. In addition, Liaoning province imported 14.244 million tons of coal in 2015 and the import of coal has seen a steady rise for many years. Second, the import demand for bulk liquid such as crude oil will be on the rise. There is not much oil reserves in Liaoning province, which means that the demand for oil import will surge as the economy develops. In 2015, the import volume of crude oil in Liaoning province was 25.243 million tons and the number has been increasing year by year (see Table 15). Third, the percentage of containerized import will continue to rise. The continuous upward trend in economic growth has led to continuous increase in goods import and export. The rapid growth of trade in finished

goods and semi-finished goods (see Table 16) has expanded the supply of goods suitable for container transport and led to continuous increase in the percentage of containerized goods in international trade. As the economy continues to develop in Liaoning province and the province sees closer trade with the global market, the trade of finished goods and semi-finished goods will play a more and more important part in the province's international trade. Therefore, the percentage of container goods in Liaoning's international trade will continue to increase. [51]

**155.** The economic structure, industrial structure and the import and export trade demand in Liaoning Province determine the mode of sea-rail transport in Liaoning Province. We propose that parallel development of sea-rail intermodal transport for bulk cargoes and container sea-rail transport in Liaoning Province should be carried out

**Table 8 2016 Import and Export of Liaoning by Country, Region and Organization**

| | Total export and import | | Export | | Import | | |
|---|---|---|---|---|---|---|---|
| | January 2016 – December 2016 | | January 2016 – December 2016 | | January 2016 – December 2016 | | |
| Country of destination | RMB (100 million) | Year-on-year comparison (%) | RMB (100 million) | Year-on-year comparison (%) | RMB (100 million) | Year-on-year comparison (%) | |
| Total | 5,712.53 | -3.999 | 2,840.78 | -9.625 | 2,871.75 | 2.3006 | |
| Asia | 3,003.50 | | -6.4959 | 1,818.06 | -7.1216 | 1,185.44 | -5.5197 |
| Hong Kong | 102.4174 | | -20.2132 | 98.7578 | -20.0944 | 3.6596 | -23.2903 |
| Japan | 840.5062 | | 6.9992 | 516.0089 | -1.6758 | 324.4973 | 24.461 |
| South Korea | 528.9179 | | -2.2316 | 266.2087 | -5.2884 | 262.7092 | 1.074 |
| ASEAN (10 countries) | 687.273 | | -12.8856 | 543.9651 | -16.3615 | 143.3079 | 3.43 |
| Taiwan | 117.5878 | | 89.9592 | 84.7241 | 161.534 | 32.8637 | 11.3775 |
| Iran | 79.518 | | -25.6497 | 25.4244 | -14.9086 | 54.0936 | -29.8138 |
| Saudi Arabia | 83.2793 | | 14.0968 | 11.5039 | -46.3027 | 71.7754 | 39.1901 |

[51] Wang Zijing: Building an International Shipping Center in Northeast Asia and Its Promotion on Foreign Trade in Liaoning Province, 2012 Dalian Maritime University Master's Thesis.

| | | | | | | |
|---|---|---|---|---|---|---|
| **Africa** | 173.5465 | -18.7891 | 53.423 | -43.2858 | 120.1235 | 0.5204 |
| **Europe** | 1,221.71 | -0.1461 | 440.8759 | -7.4135 | 780.8371 | 4.4846 |
| **Russia** | 215.0174 | 14.551 | 52.4534 | -9.3808 | 162.5641 | 25.2214 |
| **European Union (28 countries)** | 960.3004 | -3.5118 | 378.0171 | -7.3221 | 582.2833 | -0.8657 |
| **Latin America** | 427.9705 | 4.1472 | 131.6661 | -7.3949 | 296.3044 | 10.2536 |
| **North America** | 603.0637 | -5.5312 | 351.7584 | -11.8326 | 251.3053 | 4.9698 |
| **Canada** | 81.7241 | -2.9526 | 41.2503 | -2.4138 | 40.4738 | -3.4957 |
| **The US** | 519.9364 | -6.0025 | 310.5014 | -12.9494 | 209.435 | 6.6111 |
| **Oceania** | 282.3234 | 12.3097 | 44.9979 | -39.4711 | 237.3256 | 34.0533 |
| **Australia** | 229.6328 | 13.566 | 31.4374 | -45.9521 | 198.1954 | 37.601 |
| **New Zealand** | 34.5283 | 3.9987 | 5.9884 | -18.4393 | 28.5399 | 10.3698 |

Data source: Statistical Data of Dalian Customs of the PRC

## Table 9 Liaoning's Imports of Major Commodities

| **Product** | **Unit** | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|
| **Soybean** | **ton** | 113.0 | 214.5 | 195.0 | 225.0 | 236.0 | 231.2 | 287.9 |
| **Edible vegetable oil** | **ton** | 1437.0 | 3487.5 | 1514.7 | 2858.0 | 3929.0 | 14052.5 | 14036.8 |
| **Sugar** | **ton** | 2250.7 | 28143.1 | 35910.7 | 115558.0 | 603324.0 | 593851.8 | 1006821.0 |
| **Natural rubber** | **ton** | 33988.0 | 402533 | 41909.0 | 34158.0 | 53731.0 | 61282.8 | 66582.1 |
| **Pulp** | **ton** | 23902.0 | 19226.7 | 3595.4 | 66929.0 | 101957.0 | 105933.5 | 88020.5 |
| **Cotton** | **ton** | 15424.0 | 24078.9 | 23700.6 | 29169.0 | 19624.0 | 14104.4 | 3711.7 |
| **Iron ores and concentrates** | **10,000 tons** | 2915.0 | 2920.7 | 3105.6 | 2592.0 | 2800.0 | 3136.8 | 2527.5 |
| **Coal** | **10,000 tons** | 610.5 | 643.7 | 794.4 | 952.0 | 1762.0 | 1393.4 | 1424.4 |
| **Crude oil** | **10,000 tons** | 1728.8 | 1552.1 | 1166.6 | 1348.0 | 1573.0 | 1855.2 | 2524.3 |
| **Oil products** | **10,000 tons** | 47.2 | 87.1 | 121.6 | 159.0 | 154.0 | 175.1 | 161.0 |
| **Paper and paperboard** | **ton** | 28784.0 | 34344.5 | 36916.5 | 30932.0 | 32019.0 | 27935.0 | 28971.4 |
| **Cotton woven fabric** | **10,000 meters** | 1075.8 | 1180.4 | 1147.7 | | | 1189.2 | 1129.2 |
| **Synthetic filaments woven fabric** | **10,000 meters** | 5934.4 | 6925.5 | 7895.4 | 5912.0 | 6246.0 | 4938.5 | 4334.9 |
| **Billet and locking** | **ton** | 227156.0 | 37134.1 | 16981.5 | 6401.0 | 9327.0 | 18399.3 | 1984.7 |
| **Rolled steel** | **ton** | 649117.0 | 756953.4 | 932075.6 | 728949.0 | 667890.0 | 822510.4 | 803242.2 |
| **Metal working** | **piece** | 14876.0 | 16677.0 | 3825.0 | 2579.0 | 1796.0 | 2541.0 | 2220.0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **machine** | | | | | | | | |
| **Motor and generator** | **10,000 pieces** | 5099.1 | 4778.9 | 4514.8 | 4733.0 | 3460.0 | 2675.3 | 2844.4 |
| **Printed circuit board** | **10,000 pieces** | 34084.8 | 60204.5 | 90389.5 | 65988.0 | 51329.0 | 43193.1 | 32456.3 |
| **Automobile and automobile chassis** | **piece** | 7734.0 | 10788.0 | 6847.0 | 19071.0 | 12059.0 | 14905.0 | 7243.0 |

Data source: Liaoning Provincial Yearbook 2016

## Table 10Export Quantity of Main Commodities in Liaoning Province

| **Product** | **Unit** | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|
| **Frozen chicken** | **ton** | 17925.0 | 32393.8 | 30840.9 | 19416.0 | 31172.0 | 37250.5 | 42510.5 |
| **Aquatic products** | **ton** | 395516.0 | 441945.7 | 572674.5 | 627047.0 | 680007.0 | 734760.1 | 690619.7 |
| **Corn** | **10,000 tons** | 1.6 | 2.3 | 2.3 | 14.0 | 1.3 | 0.8 | 0.6 |
| **Apple** | **ton** | 59390.0 | 61846.9 | 60582.1 | 56032.0 | 62798.0 | 53704.5 | 48151.9 |
| **Soybean** | **ton** | 176835.0 | 82412.2 | 85979.0 | 171288.0 | 121952.0 | 116834.9 | 81972.7 |
| **Vegetable oil** | **ton** | 46443.0 | 25521.0 | 23742.6 | 34615.0 | 74529.0 | 57377.7 | 34753.4 |
| **Natural honey** | **ton** | 4323.0 | 5831.5 | 3571.8 | 4326.0 | 9304.0 | 10453.5 | 11799.0 |
| **Canned mushroom** | **ton** | 9956.0 | 17171.6 | 16376.3 | 15467.0 | 16239.0 | 16647.0 | 10528.7 |
| **Flue-cured tabacco** | **ton** | 3784.0 | 1818.1 | 2986.8 | 1678.0 | 2657.0 | 3079.6 | 1811.6 |
| **Soapstone** | **ton** | 144826.0 | 208655.3 | 246540.2 | 260084.0 | 268570.0 | 281720.8 | 291103.7 |
| **Crude oil** | **10,000 tons** | 28.9 | 7.6 | 8.9 | 11.0 | | 24.0 | 222.2 |
| **Oil products** | **10,000 tons** | 534.6 | 487.1 | 426.3 | 315.0 | 475.6 | 534.9 | 599.2 |
| **Paraffin** | **ton** | 306405.0 | 284712.2 | 279939.0 | 293996.0 | 299684.0 | 323606.7 | 409261.9 |
| **Synthetic organic dyes** | **ton** | 9304.0 | 8853.2 | 6367.9 | 6408.0 | 4672.0 | 5290.0 | 4370.5 |
| **Paper and paperboard** | **ton** | 4249.0 | 5916.0 | 6963.8 | 15481.0 | 35670.0 | 20913.8 | 13676.4 |
| **Synthetic staple fibers and cotton blended woven fabric** | **10,000 meters** | 3066.2 | 4131.5 | 4359.5 | 3962.0 | 3605.0 | 4008.8 | 3513.9 |
| **Concrete** | **10,000 tons** | 4.4 | 11.8 | 14.5 | 14.0 | 10.0 | 20.6 | 30.0 |
| **Rolled steel** | **10,000 tons** | 291.5 | 567.1 | 593.0 | 739.0 | 818.0 | 1275.1 | 1320.1 |
| **Metal-working machine** | **piece** | 22267.0 | 29339.0 | 28206.0 | 28332.0 | 22827.0 | 25427.0 | 12720.0 |
| **Bearing** | **10,000 pieces** | 2713.0 | 4284.9 | 5092.4 | 5224.0 | 4634.0 | 5241.8 | 5834.8 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Motors and generators** | **10,000 pieces** | 21684.8 | 32271.6 | 29258.2 | 26232.0 | 20515.0 | 19242.0 | 17265.6 |
| **Transformers** | **10,000 pieces** | 8215.2 | 11468.0 | 8802.8 | 5788.0 | 4844.0 | 6098.3 | 4903.7 |
| **TV** | **10,000 pieces** | 450.4 | 561.9 | 470.0 | 421.0 | 396.0 | 370.7 | 256.0 |
| **Automobile and automobile chassis** | **piece** | 13828.0 | 16523.0 | 19026.0 | 24924.0 | 24653.0 | 38512.0 | 23351.0 |
| **Ship** | **piece** | 8487.0 | 10194.0 | 11433.0 | 18846.0 | 20163.0 | 8969.0 | 85.0 |
| **Leather clothing** | **10,000 pieces** | 85.4 | 61.6 | 60.5 | 85.0 | 53.0 | 43.1 | 44.1 |
| **Shoes** | **10,000 pairs** | 2665.7 | 3503.9 | 3695.4 | 6559.0 | 11265.0 | 5835.2 | 2967.0 |

Data source: Liaoning Provincial Statistical Yearbook 2016

### *2. A Gradual Development for Sea-Rail Modal*

**156.** The economic development in northeast China focused on agriculture and resource-based industry in the early stage. With the restructuring of national economy, in recent years, equipment manufacturing industry has already become a new economic industry in northeast China. Modern equipment is bulk goods and suitable for container transport and the logistics mode and channels of container sea-rail multimodal transport. [52]The import and export trade in modern equipment has also increased its variety, which plays an irreplaceable role in the development of sea-rail multimodal transport in Liaoning province. Although the percentage of container goods in the import and export trade will continuously increase in Liaoning, the study team also has found that the goods suitable for bulk cargo sea-rail multimodal transport such as ore, crude oil, steel, and grain also accounts for a substantial percentage in Liaoning's import and export trade.

**157.** Although the overall economic and industrial structure in Liaoning province has somewhat been transformed, the overall economic structure is still dominated by state-owned economy and heavy industries. Due to unfavorable policy environment and the overall economic development in northeast China, private enterprises and light industries, which normally have relatively high flexibility and freedom in trade, have not seen desirable development, which in turn affects the sustainable development of logistics and transport industry including sea-rail multimodal transport in Liaoning province. In view of the speed and level of economic development in Liaoning at present, it is suggested that the Liaoning provincial government should gradually promote the development of sea-rail multimodal transport.

[52] Tong Xinliang: Study on the Development Strategy of Dalian Port Container Sea-Rail Multimodal Transport, Dalian Maritime University Master's Thesis, 2014.

### D. Further Integration of Internet Plus

**158.** In order to develop sea-rail transport in Liaoning province, it is necessary to further integrate Internet Plus into the development of sea-rail multimodal transport in Liaoning province. Recommendations to promote information connectivity are as follows:

**159.** First, allow international container sea-rail multimodal transport hubs to get and use the real-time data of TMIS If this becomes a reality, it would greatly help advance arrangement of trans-loading and production and improve trans-loading efficiency.[53]

**160.** Second, guide the adoption of cross-platform third-party value-added service for sea-rail multimodal transport and continuously improve the service. Compared to a designated information agency under a certain enterprise or department, a third-party legal entity has obvious advantages in terms of professionalism and information security to provide data integration and coordination services.

**161.** It's not enough only to set up the standard. A bridge is also needed for communication – a channel to exchange electronic data. From the perspectives of the Internet of things and information engineering, it is necessary to establish a unified and shared platform for multimodal transport, and the establishment of a joint inspection and coordination mechanism for port logistics can further improve the efficiency of customs clearance. After several studies with evidence, the study team members think that a three-tier structure should be designed to take various aspects into consideration, namely, "Railway platform – Liaoning provincial sea-rail multimodal transport platform – Liaoning provincial port public information platform".[54]

**162.** Third, actively promote the logistics support system that serves global trade, marketing network and cross-border e-commerce and develop multimodal international logistics.

### E. Management Reform Proposals given Multiple Supporting Policies

**163.** Currently, Liaoning province is implementing multiple development policies at the same time, including the establishment of Liaoning FTZ, revitalization of the old industrial bases in northeast China, and so on. Also, Liaoning has already made the overall plan for the development of sea-rail multimodal transport. Spatially, it

[53] Yin Yibai, Zhou Lijuan, Development Issues and Solutions for China's Container-Sea Rail Multimodal Transport, Navigation, Apr.2016

[54] Sea-Rail Multimodal Transport's Internet of Things: Wisdom Growth Engine of The Belt and Road, http://www.lyg01.net/news/lygxw/2015/0430/10558.shtml.

plans to develop toward the north by land to fully integrate with the China-Russia-Mongolia economic corridor and the south through sea to develop sea channels in the Asia Pacific region. The development strategy of "one core, two wings, three axes, and multiple nodes" is formed as the province optimizes its opening up and reform. Under this development pattern, the central and southern part of Liaoning province is the core for opening up; the Eurasian Land Bridge starting from the coastal economic belt and maritime shipping channel starting from the coastal port cluster are the two development wings; the development of the central part, western part, and eastern part of Liaoning towards Russia, Mongolia, and Europe are the three axis; the multi-layer, multi-field, and multifunctional platforms for opening up to the outside world are the multiple nodes.

**164.** The existing "One Belt, One Road" initiative, and policies on the development of Liaoning FTZ and the rejuvenation of old industrial bases are related and overlapping with each other. To implement these policies, Liaoning province should tackle and manage the problem of lack of connectivity in the sea-rail transport system. Sea-rail multimodal transport is a comprehensive systematic project. Therefore, it is imperative to have an authoritative agency to conduct the overall organization and coordination of sea-rail multimodal transport. [55]The study team believes Liaoning province should break the segmented management system, improve freight rate system, and establish a comprehensive organization to conduct overall organization and coordination of port sea-rail transport. To be specific, the study team suggests to set up a joint meeting system led by port administration agency in Liaoning province and participated by Liaoning customs, Liaoning Entry-Exit Inspection and Quarantine Bureau, Liaoning Railway Administration, China Railway Shenyang Group Co., Ltd, freight forwarding enterprises, cargo owner enterprises, and port enterprises to solve problems faced in the development of sea-rail multimodal transport in Liaoning and promote healthy and orderly development of the transport. [56]

### F. More Investment in Infrastructure

**165.** First, step up the construction of port railway stations to advance the development of international multimodal transport. Building port railway station connecting the railway and the port can strengthen their horizontal cooperation and increase connection and coordination between the two types of transport. Step up the construction of port logistics and distribution system especially the marshaling yard so that the railway will get to the port area to achieve fast and

[55] Yin Yibai, Zhou Lijuan, Development Issues and Solutions Facing China's Container Sea - Rail Multimodal Transport, Navigation

[56] Tao Xuezong, Zhang Rong: Experience and Enlightenment of Ningbo Port Container Sea-Rail Joint Transport Development, Integrated Transportation, June of 2012.

convenient transport and distribution. Promote the “integration of the port and railway station”, and realize seamless connection between railway cargo station and port terminals. Second, increase the investment in railway construction to expand the capacity of the sections with transport stress and increase the quantity of trunk lines to improve the comprehensive transport capacity of the railway network and create railway transport conditions. Speed up technological innovation, build vehicles specifically for containers and double-decker trains, remold existing containers, and unify the standards to balanced weight distribution within the container to meet the requirements of container transport specialization and standardization and achieve seamless convergence of the standards in rail, water, road, and air transport. Build container freight railway stations and build a number of them simultaneously. Run direct special trains between these stations to achieve overall network advantage and the economies of scale, thus promoting the development of sea-rail multimodal transport.[57]

[57] Yin Yibai, Zhou Lijuan, Development Issues and Solutions Facing China's Container Sea - Rail Multimodal Transport, Navigation

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